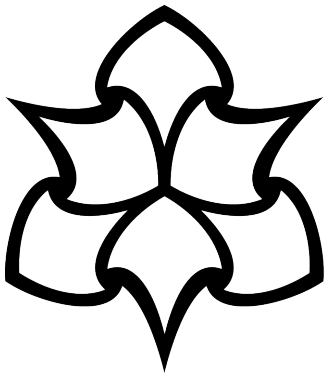

Understanding adolescent physical activity: a mixed method analysis of activity profiles through primary school physical education

S J Wilkinson

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Understanding adolescent physical activity: a mixed method analysis of activity profiles through primary school physical education

Sarah Jane Wilkinson

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Abstract

Obesity is a key government issue worldwide, with physical activity contributing to reducing prevailing issues. Physical Education (PE) in schools is a predominant setting to target growing participation and enhance engagement in young children. The importance of encouraging young children creates a more likely chance that physically active lifestyle behaviour will continue into latter years. Not only helping short term issues but also producing long term, sustainable outcomes, such as reducing the risk of major diseases and increasing quality of life. This thesis provides an insight into assessing primary school children's physical education lessons by profiling student's activity. A self-designed and validated observation tool is used to asses sixteen children in year 5. The tool not only assess physical exertion levels but also provides context of activity against that level: as well as providing data acknowledging each participant's interaction throughout the lesson. More recently, many researchers support a mixed method approach in such investigation, however there is still very little to prevail. Therefore, semi-structured interviews also took place with the children and teachers: to gain a greater dearth of knowledge so method triangulation can be used to generate further explanations and theories. Outcomes from the study explored into class type and gender differences, highlighting environmental factors too.

Chapter 1 Introduction as an overview

Physical activity (PA) is one of the key health behaviours that contribute to reduced mortality and morbidity worldwide (Lee et al., 2012). There is strong evidence to show that physical inactivity increases the risk of many health conditions, such as coronary heart disease, type 2 diabetes, and breast and colon cancers, and shortens life expectancy (Lee, 2012). On the contrary, leading an active lifestyle has been shown to provide multiple benefits, including improvements in health and wellbeing, and is associated with an improved quality of life (Dumuid et al., 2017; Andersen et al., 2017). Whilst many of the diseases associated with inactivity manifest predominantly in adults, 'even at young ages, low physical activity is associated with a clustering of cardiovascular disease risk factors' (Larouche et al., 2016, 3). This represents a strong concern, as research evidence consistently demonstrates that children's level of physical activity is insufficient and represent what has been referred to as the 'physical inactivity crisis' (Larouche et al., 2016).

In the United Kingdom (UK) a recent report (Inactive UK, 2016), highlighted that over half of all children were not meeting the recommended level of daily physical activity, which is clearly a significant contributory factor to a third of children being designated as "overweight" (Wilkie et al., 2016); a condition that doubles the prevalence ratio of cardio metabolic risk factors in most age groups, including children (Lee et al., 2012). In contrast to the negative impact of inactivity, it is widely accepted that engagement in physical activity is vital to the health of all age groups, and is particularly significant for children, since engagement at an early age is a contributory factor for lifelong engagement (Laakso et al., 2008; Scheerder et al., 2006). Moreover, high levels of physical activity in children have been reported to be beneficial to social development, educational attainment, and growth and maturity (Tammelin et al., 2014).

Whilst the promotion of investing in an active lifestyle is viewed as significant, both physically and mentally, it is equally important that factor associated with disengagement from physical activity are examined. Extensive research has been undertaken on childrens' disengagement with physical activity, and many factors

proffered as being contributory, such as, peer influence, availability of facilities, competence enjoyment, motivation and competing. Social attitudes arise as adolescences get older, therefore, impacting on engagement levels especially in primary physical education as well as active recreation (Green, 2014; Smith, 2006). It is apparent that the age at which children start to disengage with physical activity is unclear, although Tammelin et al. (2014) argue that levels of activity negatively correlate with age and drop off rates accelerate most during teen years. Rochelle et al. (2016) suggest that activity levels peak for children at 12-13 years of age, and then continue to decline in later teenage years. The British Heart Foundation (2017) highlighted that activity levels decline greatly from primary school to secondary school, seemingly pointing to children's maturation as significant. However, Green (2014) contests that exercise levels declined long before adolescence, as children have already started to disengage with activity as soon as those contributing factors start to take place; this is seen long before adolescence.

Gender is a further factor to consider when examining children's engagement, and disengagement with physical activity. The British Heart Foundation (2017) highlighted that whilst both boys and girls show significant 'drop off' in the later years of primary school, the proportion of girls' disengagement was seen as higher than boys. Such a notion is reflected in recent research, in which gender has been outlined as being influential on participation rates in physical activity; girls, on average, having lower participation rates than boys of a similar age (Wilkinson and Penney, 2016; Halim et al., 2017). Using a self-reporting approach, to examining gender differences, boys were found to participate 25% more in physical activity than girls (Dyrstad et al., 2014; Beville et al., 2014). However, this approach may be questioned since boys have been found to over-report themselves being physically active 67% more than girls (Dyrstad et al., 2014). Other researchers suggest that gender differences may be more due to societal gender biases (Beville et al., 2014).

Whilst physical and emotional maturation, alongside gender may influence engagement and disengagement in physical activity, other external factors must be considered. In particular, time available for engagement with physical activity can be

viewed as a significant constraint. The role of play has been extensively researched and highlights particularly the important influence of outdoor play on the physical, social, emotional and cognitive wellbeing of children (Burdette et al., 2005; Gill, 2014; McCurdy et al., 2010; Tremblay et al., 2015). However, outdoor play, in many counties, included the UK, is limited by climatic factors and season. For long periods, outdoor play for young children is limited to daylight hours. Hence, in winter months, the opportunity to engage in outdoor physical activity is severely impinged, particularly when daylight time is predominantly during school hours. Children in UK schools have limited opportunities to engage in high physical activities. Within the typical school week, children may engage in unstructured play, (which is also weather dependant) and structured classes in physical education (PE); however, the nature of the unstructured 'play time' means children can easily opt to engage in more sedentary activities, thus further limiting opportunities to be physically active.

Whilst PE could be viewed as a panacea, in reality physical activity promotion can only be part of the PE curriculum, since 'PE is designed to apply and develop a broader range of skills, enjoy communicating, collaborating and competing with each other, whilst also fostering an understanding of how to improve and recognise their own success' (National Curriculum, 2014). Moreover, PE also needs to focus on the current health problems, target successful health promotions and educate children to lead an active lifestyle, whilst providing the only scheduled and structured time for children to be physically active. In primary schools, PE has a very limited, and often disproportionate, weekly time allocation compared to other subject areas. Despite these constraints, PE has to be viewed as part of the curriculum where children can, and should, engage in moderate to vigorous levels of physical activity. Thus, it is imperative that PE lessons are contributing significantly to government guidelines for activity levels in children (Lonsdale et al., 2013). The importance of early engagement, through PE, is imperative, since research indicates that habitual physical activity at a young age correlates to an active lifestyle in adulthood (Jones et al., 2013; Tammelin et al., 2014). PE may also be the only readily available opportunity for children from disadvantaged backgrounds to engage in structure activity, due to external barriers, such as cost, to 'out of school' physical activity opportunities (Gauvin, 2003). Sport

England (2013), the nation's strategic lead for sport and physical activity, reported that 47% of 16-25 year olds are not taking part in any sport or physical activity once outside of their formal education.

In recent years, in an attempt to better understand physical activity, many primary schools have undertaken observations and measurements relating to childrens' physical activity, although of some concern is that fewer than half of the schools surveyed knew the actual time children spent in activity (Inactive UK, 2016). This work implicated either a lack of interest or understanding of mapping physical activity. Researchers have also undertaken many studies, using a variety of approaches, both qualitative and quantitative, in an attempt to profile children's activity levels; however, often the methods employed provide limited information, often lacking in context, or are either flawed or include inherent biases (Carvalho, et al., 2015; Lee and Shiroma, 2014). As such, the results of such profiling need to be viewed with caution.

The qualitative approach to profiling physical activity (interviews, questionnaires, focus-groups, self-reporting etc.), is still today one of the most widely used tools, alongside being the cheapest and easiest to access and deploy. However, these instruments enable participants to under or over report their activity which in turn leads to bias results (Sallis and Saelens, 2015; Rachele, et al., 2012; Van der Ploeg et al., 2010). Research which focuses on employing more quantitative methods, such as accelerometers; heart rate monitors; and more recently Global Positioning Systems (GPS) (Sylvia et al., 2014; McNamara, Hudson and Taylor, 2010; Westerterp, 2009; Macfarlane et al., 2006), also highlight initial limitations. They are restricted with memory capacity and battery life alongside, not recording any contextual information. There are also implications for using heart rate monitors. Factors such as: anxiety, nerves and overexcitement raising heart rate just as physical activity will are apparent. Therefore, reporting rising heart rate levels to be increased activity can be inaccurate (Westerterp, 2009; Achten and Jeukendrup, 2003; Janz, 2002).

Observational analysis is widely used in the sporting environment, and can report upon many different things. Observational analysis can be undertaken with very little equipment and can be achieved in a live or post-event setting. Observational analysis

can be time consuming and viewed as too subjective, the role that the researcher takes in the research process is paramount; too much involvement with the participants will affect the situation and thus validity of the findings. This can be observed with recall alone; it is restricting as unintentionally subjective data is received by inaccuracies such as: observer bias, arousal level and errors in attentional focus (O'Donoghue, 2010; Maslovat and Franks, 2008). However, if used correctly, observational analysis allows access to situations that self-report measures may not be able to assess, as seeing participants in real life situations gives a strong and in-depth understanding of the data; the data will be able to give context and meaning to explain the researcher's intention and therefore fulfil the aim of the study (Wakefield, 2008; Rothwell and Bhatia, 2007; Williams and Thompson, 2004). Although, methodological challenges are evident within the majority of assessment tools and comparison across studies is problematic. Combining both qualitative and quantitative data through a mixed method approach enables a deeper understanding of children's physical activity during PE lessons by both context and experiences.

Research Aim:

To understand the profiles and experiences of primary school children's physical activity levels in physical education; in particular, assessing any gender and class types differences.

Research objectives:

1. To design a real-time notation template to measure physical activity and on/off task behaviours during physical education lessons
2. To analyse children's physical activity and behaviours in relation to class type
3. To analyse children's physical activity and behaviours in relation to gender
4. To explore the perceptions of PE in the context of intensity, duration and child experiences through the eyes of the teachers and pupils.

Chapter 2 Children: when did moving become so difficult?

Children over the last decade have become more sedentary than ever with childhood obesity becoming increasingly prevalent. A great deal of research has been undertaken recently, and highlights the problems of decreasing physical activity of young children (Wood and Hall, 2015). Statistics suggest that only 15.5% of boys and 13.1% of girls in primary school actually achieve 60 minutes of Moderate to vigorous physical activity (MVPA) a day (Hatfield and Chomitz, 2015).

As the government are aware of the problem, policies and campaigns emerged to deal with the issue with initial strategies targeting healthy eating. The schools fruit and vegetable scheme (SFVS) is just one of the many initiatives that was designed to help children achieve their five a day, alongside, lessons taught by teachers to educate children on a healthy lifestyle. These initial strategies to overcome obesity were solely based on heathy eating, more recently increasing physical activity has become one of the UK Government's key public health policy targets. *Change4life* is a national programme introduced by Public Health England (PHE), it aims to protect and improve the nation's health and wellbeing. This became one of many interventions with the intention of getting children aged 5-11 years active and achieving the required 60 minutes of physical activity a day. In July 2015 for the second year running the campaign set to increase children's activity levels over the summer months, as the previous years (2014) campaign resulted in children being active for an additional 104 million minutes (Public Health England, 2015; Chalkley et al., 2015). In 2015, Change4life introduced the 10 minute shake up game. This allowed children to join one of four Disney teams; Toy Story, Frozen, Monsters and Big Hero 6 and help their team win by doing as many 10 minute 'shake ups' as they can every day. The previous year's statistics provide evidence, that by uniting Change4life and Disney, children were encouraged to engage in more physical activity (Public Health England, 2015).

Parents have previously been blamed for their children's inactivity (Schwartz and Puhl, 2003), alongside watching television, playing computer games and surfing the

Internet. These powerful environmental inducements aimed directly at children have enabled them to adopt an unhealthy lifestyle. Lifestyle culture has shifted over the past decade, with inactivity in children rising over 5% (Wolfson et al., 2015). Children of a young age have little control over their own decisions, therefore they are largely dependent on others informing their behaviour and choices. By having the technology that is around today, for instance: a tablet, games console or computer, to choose to play an electronic device is far more prominent than to play outside with friends (Staiano, 2012). Gaming has been suggested as the 21st century way of socialising and making new friends (Staiano and Calvert, 2011). Studies have associated television and gaming use to children being overweight. These activities are assumed to displace more active activities and facilitate sedentary lifestyles. Whilst, encouraging more sedentary behaviour, researchers have also suggested that these recent forms of child activity also increase calorie intake, from either eating whilst viewing or from food being advertised on television (Vandewater et al., 2004).

The extent of viewing and gaming time in children differs significantly from weekdays to weekends. In the week children spend most of their time at school and have limited access to electronic forms of play and entertainment. However, at weekends children have free time to participate in whatever they please. Despite such trends, there needs to be some recognition of the hours available to children to be active, with an average of seventeen waking hours available sixty minutes of those to be active is achievable. Entertainment based activities may be on the rise but children have more than enough time to still take part in activities of their choice and be active for a minimum of 60 minutes a day.

Some children may choose technology over activity, others have no choice. Parenting styles are shaped by attitude but also external factors have an influence. Parents feel they need to conform to the norm; otherwise they become paranoid. Paranoid parenting is when parents are concerned about doing the right job, this often leads to parents copying the behaviour of other parents so they do not get judged, even if that behaviour is not what they believe to be correct. Such behaviours have been reported by Evans and Davies (2010) to impact on the physical activity levels in children. For example, at weekends and weeknights as parents are afraid to allow children

unsupervised time, particularly outside, to take part in what they want; these activities may not always be physically active; however, parents are over protecting their children and this may be resulting in reduce physical activity.

To put this into context, children's independent mobility has fallen significantly since 2000 and also incurred a steady decline over the past fifty years (Carver, 2015). Children's free time has been categorised as one of the main ways in which children can engage in physical activity. Free time is intrinsic to children's quality of life, it is one-way children can freely enjoy themselves and do what they want. However, if parenting is impacting on the amount of free time, this will restrict the level of activity from the outset.

Research supports the notion that today's culture and lifestyle is very different from what it used to be. Therefore, this may be one of the reasons inactivity and obesity in children is at its highest aross the UK. With children, it is clear that they spend the predominant time of their waking hours in school, hence providing an environment that is an effective setting for early public health prevention strategies and to support the promotion of physical activity among children (Klakk et al., 2014; Hind et al., 2014). All segments of the population go to school, including all risk groups; implying that schools are a prime location to improve and increase physical activity for all by instilling physical activity as a daily behaviour (Moller et al., 2014).

Physical Education, play and schools: what are the benefits?

The Government state that children and young people aged 5-18 should engage in at least sixty minutes of MVPA a day with intense activities, including those that strengthen muscle and bone three times a week and finally as a whole reduce time spent being sedentary (Department of Health, 2011). This is supported by many policy documents and research that report high correlations between health and levels of daily physical activity (Reiner et al., 2013; Janssen and LeBlanc, 2010). Powell et al. (2011) discusses the Governments recommended guidelines in context, reporting, that a little activity is better than none, and more activity is better than some. Thus,

implying that individualisation has an impact on levels of activity, as long as you are doing more than you were before, you are starting to become active. Stating specific guidelines can be disheartening to some as it is an unattainable target and not participating is better than failing. Improved guidelines outlined by the Nation Health Service (NHS) and chief medical officer's state that children are advised to take part in one hundred and eighty minutes of physical activity across the day (Active UK, 2011). This does not have to be continuous but calculated for the sum throughout the day, therefore, it may be sporadic or intermittent but children are still active and their activity can be recorded. This guideline may be more obtainable than the current Government policy but individualisation has not still not been taken into account.

In satisfying the government guidelines, active children are known to accrue a number of benefits. Many reports have stated physiological, psychological and social benefits (Gill, Williams and Reifsteck, 2017; Eime et al., 2013; Reiner et al., 2013). In depth research into the physiological factors relating to physical activity have been explored. Health indicators relating to diabetes, bone density, blood pressure, heart disease and cancer. Unopposed reports have highlighted a poor diet and lack of exercise have being attributing factors for such health implications (Spencer, 2015; Winther et al., 2015; Dillner, 2015). Furthermore, over the last 15 years' exercise has also been linked to combating a number of psychological factors (Smits et al., 2008). Exercise has now been summarised as a therapy for clinical and subclinical depression and anxiety (Fox, 1999). Fox (2000) argued, physical activity also promotes a high level of self-esteem (Disman, Hales and Pfeiffer, 2006) and has positive impacts upon the human brain and mental state, particularly improving attention, concentration and memory (Voss, et al., 2011; Taras, 2005). Whilst social benefits are also important, peer acceptance and high levels of confidence have been attributed to someone who is physically active (Glazebrook et al., 2011). Moreover, increased physical activity has been related to children having a wider circle of friends, and becoming more comfortable to interact with peers (Gill, Williams and Reifsteck, 2017).

Schools are potentially effective settings for early public health prevention strategies (Klakk et al., 2014). The World Health Organisation (WHO) have also identified schools as a target setting for the promotion of physical activity among children (Hind et al.,

2014). Whilst it could be argued that children are predominately inactive during most lesson periods, there are a number of opportunities for the development of enhancing physical activity during the school day. 'Playtime' and lunch periods offer time and space to develop the physical activity of the child. Playtime in schools has been defined as non-curriculum time between lessons when children can freely engage in their choice of leisure activities (Parish et al., 2013; Ridgers et al., 2006). Playtime for children is mandatory in the UK, and can account for up to 25% of the total school day. This period of the day is vital as children's fundamental movement skills, described as the foundations for lifelong engagement in physical activity, are known to be developed within these times (O'Dwyer et al., 2013). To emphasis the importance of morning break and lunchtime break, Ridgers (2010) suggested that within these periods children may engage in up to 40% of MVPA. In an attempt to enhance children's activity during 'playtime' researchers have sought to initiate a range of interventions, including the use of playground markings, fixed and portable equipment and recycling rubbish to help encourage unstructured play. Such interventions are claimed to have a positive impact on children's activity levels on the playground. Whilst undoubtedly, some interventions have acute effects, not all attempts are successful. For example, some studies have reported interventions decreasing activity levels, including: organised club activities and multiple playground marking strategies. A further concern is that it has been demonstrated gender differences in activity levels of the playground, and intervention strategies aim at promoting activity. Ridgers et al. (2012) proffered that boys are more active than girls during playtime and take part in sport based activities, whereas girls are more likely to socialise with their peers, engaging in more sedentary playground activity. Moreover, Elder et al. (2011) argue that with the presence of playground interventions, typically boy's level of activity declines more than girls, inferring that boys would naturally be more active than girls.

With 'playtime' portrayed as influential, it would be beneficial for that time to at least contribute to physical activity. Nonetheless, it is not that simple. With health and safety laws at their utmost in today's society, there seems to be too many hurdles to jump through to allow children that time to engage in physical activity. For several

years, primary schools have banned football on and off on a weekly basis at playtime, this may be due to many factors which could include behavioral issues but instead of addressing that issue, physical activity is taken away. Over decades, children have taken part in gymnastics on the playground. Now, schools have even prohibited this engagement. Schools have categorised such activities as 'not safe'. Most recently, Leeds School have put a ban on tig, running in the playground is 'not safe' (Clark, 2015). With so many restrictions and rules in place how can children spend their free time how they want?

PE provides an opportunity for children to engage in moderate-to-high intensity physical activities, within a structured or semi-structured environment. In the UK, the National Curriculum aims to inspire pupils to succeed and excel in competitive sport and other physically demanding activities. It was designed to optimise pupils' opportunities to become, and maintain, physical fitness and health, whilst contributing to building self-confidence, competing in sport, and embedding key values, such as, fairness and respect. However, in key stages one and two, there is no compulsion to adhere to a proposed curriculum other than relating to swimming and water safety. Kirk (2014) questioned the use of the national curriculum and queries the understanding of those engaged in devising the curricula, suggesting that it is problematic when applying theories into practice and an enhanced understand needs to be adapted by the teachers.

Although PE is part of the national curriculum it has been documented that lessons often occur infrequently, and where classes do take place children are inactive for the majority of the lesson (Hind et al., 2014; Lonsdale et al., 2013), in some cases children spend less than 40% of their time engaged in physical activity (Fairclough and Stratton, 2005). It appears that little has changed in the past decades; Sallies (1997) argued that PE provided an estimated 17 minutes per week per child, contributing less than 5% a week to the recommended requirements, clearly reflected in the findings in 2005 reported by Fairclough and Stratton, and more recently Moller et al. (2014) has indicated that by increasing the number of PE lesson's then physical activity levels will rise. However, PE lessons are not meeting the required recommendations, therefore instead of increasing the number of PE lessons, the already allocated lessons need to

be improved.

A systematic review of PE interventions was published by Kriemler et al. (2011). Kriemler reported that 47%-65% of interventions were found to be effective and increase physical activity levels, however, the optimal intervention has still yet to be discovered. Evaluating the different activities influence upon physical exertion levels has been reported to have an impact. The top played sports and activities are: football, netball, athletics and basketball and these all have a physically exerting nature. However, more recently, schools are incorporating dance and movement activities into the curricula. According to Wood and Hall (2015), MVPA has been noted to vary regarding the type of activity chosen for the PE lesson. As PE is not only associated with providing physical activity but also providing 'education', with this in mind, it may not be surprising that every PE lesson is not as physically intense as deemed appropriate. Fairclough and Stratton (2005) found that when team games or individual activities were incorporated into PE children had higher levels of MVPA than when taking part in movement activities or individual games (Waring, Warburton and Coy, 2007).

Chapter 3 Stereotypical segregation

With the view of equality in mind, Evans (2017) states that PE lessons are vulnerable. The 'able' are predominately picked out from the 'less able' therefore, regardless of their enthusiasm to engage; the opportunities from the outset are limited. Contesting this, PE lessons should be an environment where the selection of hand-picked children is reduced. Sports clubs are opportunities where the gifted and talented may excel but in PE lessons everyone should be engaged and take part the same as one another, no matter their ability.

Historically, male participation in sport has dominated and the decline in physical activity levels in girls has been well reported. Halim et al. (2017) have explored into young children's attitude and gender. Halim argues that children from the age of 5 years old recognise gender categories which shape their attitudes thus influencing their behaviour. From early childhood, children are presented with gender cues, even as early as new-born's been categorised into pink and blue. These cues form the basis for childhood interactions and initiate the development of stereotypical behaviour (Bigler and Liben, 2007). It is imperative to understand the timing and magnitude of gender cues influencing children's behaviour as this can help eliminate the barriers that are occurring, forcing girls to decline with engagement in physical activity. Although Halim et al. (2017) states that children as young as 5 years old recognise gender cues other research has suggested that insufficient evidence exists when understanding gender influences upon activity and further explains that children in primary school are too young to understand gender differences (Trost et al., 2012). Bigler et al. (2008) explains that it is evident that gender segregation exists in activity but at what age does it start to become an issue. If the current academic literature cannot draw conclusions to this, then research needs to underpin at what point gender differences are becoming apparent in physical activity. Schools are a particularly important environment: where PE is a recommended setting to analysis activity profiles in boys and girls and distinguish at what age theses are becoming evident.

Davidson, Cutting and Birch (2003) evaluated gender responses to physical activity and distinguished parental attitudes effected physical activity levels. It was reported that fathers were more supportive of boys playing sport and mothers were logistically supportive, whereas towards girls both parents were unintentionally evasive to support them. At a young age, parental influence is detrimental to engagement: without encouragement and support it is unlikely that engagement will take place (Gustafson and Rhodes, 2006).

Chapter 4 Can We Measure physical activity?

To be able to surmise accurate conclusions, the process for data collection needs to be reliable and validated, this will enable more dependable data set from the findings reported in order to believe the arguments embodied. When it comes to monitoring participant's performance responses to specific activities there are various tools and methods that can be adopted, for instance; heart rate monitors, monitoring of saliva and specific blood variables, use of psychometric questionnaires, pedometers, GPS and video analysis. With obesity rates continuing to rise it is essential that physical activity researchers use the most fitting methods when measuring exposure.

Large scale studies mainly rely upon self-report instruments, such as: survey's and questionnaires, to measure physical activity. These methods can vary in what they intend to measure (mode, duration, frequency of activity) and can be tailored to the specific group under analysis. There are many advantages to using self-report instruments as Besson et al. (2010) explains: they are cost effective and can be used in extensive research, ease of administration as they are simple to distribute and undertake, as well as accuracy in measuring intense activity. Shepard (2003), rationalises the disadvantages of using self-report instruments and concludes that deep inferential analyses cannot be undertaken as energy expenditure cannot be identified, data may also be limited by the individuals written English, whether it be the researcher (questions) or the participants (answers), external factors, such as: social desirability, complexity of the questionnaire, age or seasonal variation and finally failure to recall. When answering a questionnaire or survey it is after the event and therefore participants are expected to remember what has happened to answer the question, when using this method on children is it more adverse as children can make up information and start to tell a story instead of real-life events.

Heart rate monitors provide evidence of resting, exercise and recovery heart rates. However, due to contrasting evidence in the literature heart rate (HR) monitoring is not accepted as a gold standard (Buchheit, 2014). HR monitors are widely used for: inexpensive, non-invasive, not time consuming and can be used routinely and

simultaneously in a large group of participants. More recently the use of HR monitoring on portable recorders and smart phone applications has made the method readily available and easy to use rather than more expensive laboratory-based electrocardiograph recorders (Gamelin et al., 2006; Weippert et al., 2010; Wallen et al., 2012; Flatt and Esco, 2013). However, using HR monitors solely may lead to misinterpretation of the data, recent studies (Mclean et al., 2010 and Buchheitet al., 2013) explain that by using HR monitors alongside training logs, questionnaires and other data collection methods it will offer a broader knowledge base and provide a better understanding of the data making it more reliable. Furthermore, HR monitors use a chest belt on participants and this may lead to limitations as wearing these may not always be convenient or ethically accepted if using on younger children. As well as exercise, there are a myriad of factors that may increase HR, these may be factors such as getting anxious or excited (Ainsworth et al., 2015). Therefore, merely relying upon HR data to conclude activity levels may be heedless as the HR may not have increased due to physical activity but due to other stimulus that will affect the data.

A pedometer is a simple, low cost instrument that measures the number of steps taken by an individual. The device is popular across many different studies recording physical activity especially when needing to pick up short burst of physical activity which other systems such as self-report instruments fail to measure (Slyvia et al., 2015). Activities that require vertical motion yield the most accurate results from a pedometer, for instances, running and moderate walking whereas solely upper body activities are not recorded. Different varieties of pedometers conclude with different data outputs, alongside the device not measuring intensity, frequency and duration, therefore the data generated is extremely limited and unreliable.

Over recent decade's accelerometers have gained acceptance from their accuracy and ability to capture large amounts of data even from a large sample-sizes (Westerterp, 2009). An accelerometer measures acceleration and detects movement, this data can be translated into biological (energy expenditure) or physical activity patterns (stationary). The device has to be worn on the body, this can be in a number of places including: thigh, hip and waist. Recent studies carried out by the NHS provide evidence that accelerometer data is used to show the volume, rate and time spent in intensity

during exercise. The wide acceptance of accelerometers is seen by the minute by minute monitoring of activity, capturing different intensity levels. However, these devices are expensive and require expertise knowledge when handling and retrieving the data, alongside, there been no context to the data, as the understanding behind the figures is non-existent.

Choosing the right method

To be able to report on factors influencing children in physical activity it is paramount we understand what children are doing in PE lessons. Other researchers have highlighted how much time children spend been physically active in PE by analysing them using different methods, however we never know what they are really doing and how the activity level reflects this. Quantitative data alone only allows the researcher to see numbers and analyse figures, these figures may have meaning but to understand their meaning a qualitative explanation is required. To only have qualitative or quantitative data limits the depth in which physical activity in children's PE lessons can be investigated, also the limitations to such assessment tools are prominent. The reliability of the data produced is impractical as invalid and unreliable findings cannot be quantified for future research and have little implication on the research aims and objectives. By creating a unique profiling tool that will capture children's physical activity level and the context in which the activity is undertaken will allow a greater depth of understanding into what extent children are contributing to PE lessons of different types. Alongside this, integrating interviews with the class children, PE teacher and class teacher will allow a broader knowledge base into the experiences of the lessons through the eyes of the participants and associated adults. Not only this but a mixed method approach will facilitate a myriad of benefits as the weaknesses are offset by the advantages of each methodology. This approach will allow the quantitative data to be reinforced by the qualitative data and vice versa. To enforce a reliable and coherent method a systematic approach is needed, the assessment tool will be tested through vigorous tests against a gold standard to ensure full reliability.

Chapter 5 Developing the methodology

Introduction

This chapter will inform the reader of the chosen research design for this study and justify the data collection techniques employed to gain insight into children and their activity levels and context. A greater understanding of the perceived perception of children's exertion levels in physical education and their experiences can be detrimental in future deployment of the curriculum. This study will acknowledge the concerns raised by the government and the epidemic issue of an inactive lifestyle by addressing the following research questions:

1. Are children in today's society having enough opportunity to be physically active?
2. What are children doing in the opportunities provided?
3. What are children's activity profiles in PE?
4. How do children and teachers perceive PE in the context of intensity and duration?
5. How do children's experiences impact their active behaviour?

Initially, an account of how the research design was developed is presented. This will provide an insight into the complex nature of researching the lifestyles of young people and includes epistemological and ontological considerations. Then the ethical approach will be explained, the data analysis techniques explained, outlined and justified and finally the thorough method into assessing the reliability of the designed assessment tool for profiling the children.

Design

This study employed a mixed-method, case study design and consequently considered interpretivist and positivist ontologies. In this study, mixed method was defined as

research that involves collecting, analysing and integrating quantitative (activity profiling) and qualitative (interviews) research; using more than one methodological strategy in the same study (Morse, 2016). A mixed-method approach was adopted to directly compare and contrast the quantitative and qualitative results, whilst also validating and expanding the quantitative results with qualitative data (Creswell, 2006). Morse and Niehaus (2016) have proposed a mixed method approach as a broad and significant way of using two research methods to answer a single research question, whilst producing strong publishable findings. If executed correctly, the results of a mixed method design have been suggested to be more significant than using one method alone (Hussein, 2015; Bryman, 2015). According to Patton (1987), the choice of research method must be appropriate to the subject under investigation. Using a single methodology often fails to explore all areas of interest and can limit the outcome either statistically or descriptively.

Due to the systematic approach and the research aim, a case study method approach was adopted. This therefore allows a greater depth of detail to be collected upon the subjects and provides advantageous as designing and validating a new profiling tool is a novel approach. Data collected cannot be generalised as it is only from one school, however, future research can investigate into greater quantity of subjects with greater lengths of time.

Ontological and Epistemological considerations

The term paradigm forms a basis for the practice of science and helps direct the research by allowing the appropriate method to be undertaken to explore a particular phenomena. According to Sale et al. (2002), 'Interpretivist' and 'positivist' paradigms are two broad approaches to research, whereby academic perspectives can draw upon similar ontology and epistemologies. It is non-negotiable that physical activity is formed from behaviour and a number of different external forces inform this. A positivist approach takes into account objective scientific and statistical evidence based on 'fact' alone (Walliman, 2001) and an interpretivist approach relies upon social constructions associated with people's opinions and feelings (Cohen et al.,

2013). Consequently, physical activity becomes difficult to measure using solely a positivist approach or an interpretivist approach.

'The great paradigm wars' (Gage, 1989) or the 'paradigm problem' (Chambers et al., 1992) have been considered in the development of this research design but rather than pose a dichotomy, this research took a more pragmatic stance aligned with thinking that '…there is no need for a dichotomy between the method-types and there is every reason to use them together to satisfy the demands of the research in the most efficacious manner possible' (Cook and Richard, 1979: 27). Therefore, supporting this notion as the method developed, a paradigm shift occurred and new modes of thought challenged the existing paradigm issue; the mono-methological, positivist design, undertaking a profile of activity, became a mixed-method design, incorporating interpretivist and social analysis via interviews. Uniting both approaches chosen by the nature of the research problem allows greater magnitude of data and complexity in terms of integrating both qualitative and quantitative data, allowing one to inform the other. The quantitative and qualitative paradigms adopt different ontological positions. The quantitative approach, criticised for its' isomorphism between its measures and 'reality' (Sparkes, 2012) and lauded for its generalisability and validity can, if implemented properly, provide useful additional perspectives about 'reality'. Combined with a qualitative approach based on a 'relativist' ontology, where reality is not a single entity and the 'truth' may appear in different versions that need to be recorded and reported, between methods triangulation will, according to King and Horrocks (2010), enable the mixed-method approach to inform and apprise the quantitative data and qualitative data and further validate this. This study attached itself to no particular individual ontological position. Instead, it would benefit from a combination, marrying a realist and relativist ontology.

At the epistemological level, the quantitative paradigm clearly separates the researcher from the research as if they are two separate entities and the researcher can remain detached from the phenomena under investigation (Johnson, Onwuegbuzie and Turner, 2007). In this case meaning that the researcher or the research is not influenced by a person's feelings or opinions but is representing the facts, therefore allowing data collection and analysis to be unbiased. This is devised

by using a positivist design, that this study adopts, as it limits the interaction between the investigator and the investigated.

However, this study is designed to stimulate the real event and observe various outcomes that occur naturally in the physical education lesson reported by child experiences. In relation to this, qualitative researchers dismiss the scientific paradigm for evaluating the social world. Developing an insight and understanding into the social realm, which enables the researcher to get close to the data, therefore forms perceptions of the phenomena. Incorporating these different levels of epistemologies allows the study to utilises a phenomenological epistemology in order to explore phenomena in context of intensity, duration and child experiences through the eyes of the pupils and teachers. Whist also incorporating a hypothetico-deductive epistemology, in which causal explanation and prediction form a logical theory. Where data collection methods are undertaken in a physical education lesson to prove or dis-prove a pre-instated hypothesis.

Supporting the mixed method ontology, objective measures will be triangulated with a social analysis of children's lifestyle. To assist research objective four an epistemological approach was required that captured the realities of these children's experiences from PE. Numerous epistemological approaches were considered as an important part of the research process. Carter and Little (2007) explain that epistemologies enlightens the methodological approach and justifies knowledge (see figure 1), therefore, allowing a number of epistemologies to be contemplated.

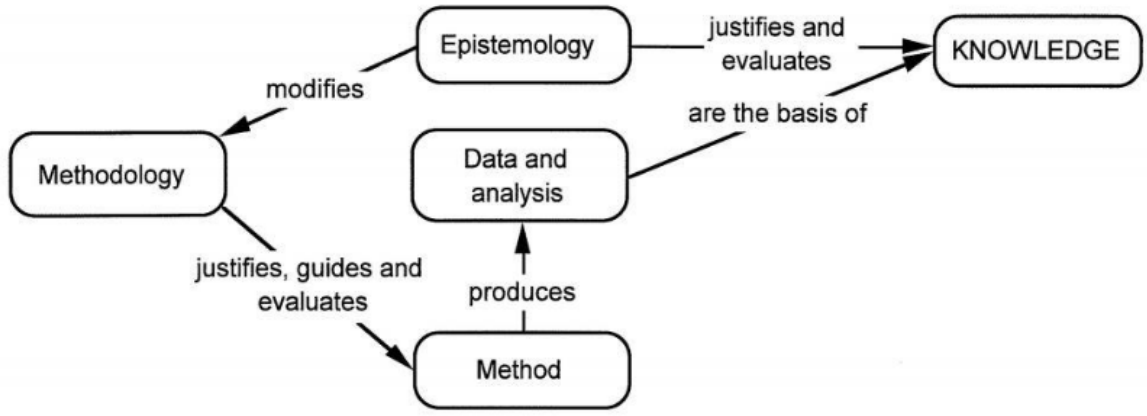

Figure 1 The simple relationship between Epistemology, methodology and method (Carter and Little, 2007)

However, taking in to account the context, setting and the implementation of the method it was most appropriate to take a phenomenology position, as this approach employed a systematic, objective view through the experiences of 'real life' events of children in physical activity. Positivism, which detaches itself from the real world, concentrates on observation, whereas, constructivism builds ideas on beliefs and ideals (Perry, 1997) and therefore, recognises that reality is real (Trochim, 2006). However, by employing a mixed-method approach, uniting quantitative and qualitative analysis, both positivistic and constructivist approaches were deemed appropriate. This was in order to gain an insight into undisturbed physical education lessons to obtain a profile of activity and to uncover the perceptions of children's activity levels through experiences.

Paradigmatic considerations

For over a century quantitative verses qualitative methods have advocated a dispute in the world of research. Many researchers have participated in such debates claiming that only one paradigm can be used at any time and they should not be mixed (Howe, 1988). Both the quantitative and qualitative paradigms have distinct features which lend themselves to a dominant focus, whereby, quantitative methods instil 'hard, generalisable' data and qualitative methods result in 'deep, rich observational' data (Sieber, 1973, p.1335), with both paradigms having positive and negative implications. Within the quantitative field of research, usually with a sufficient sample size: findings can be generalised when based upon a random sample size, quantitative predictions can be made, variables can be diminished allowing a more creditable assessment of the cause-and-effect relationship, the collection of quantitative data is relatively quick and provides precise numerical data and the researcher can become independent of the researched. This can be achieved by the researcher being discrete and remaining isolated from the participants to avoid influencing data. However, the researcher may miss out on phenomena occurring as the focus is theory based or testing a hypothesis and also the knowledge produced may not truly reflect the outcome as context and individuals are overlooked. When adopting qualitative methods data can be: based

upon participant's perceptions and experiences of the phenomena, allow a limited sample size (case study) which enables complex analysis, data can be collected in natural setting and changes during the conduct of the study can be taken into account. Nonetheless, qualitative methods may not produce generalisable data and it is difficult to make quantitative predictions or test a hypothesis. Time constraints apply to the collection of data as it is a longer process and the analysis of such data is also a lengthy procedure and finally the results can be influenced by researcher biased and idiosyncrasies. Thus suggesting, qualitative and quantitative paradigms are both useful and important. Therefore, this study, units both paradigms together, replacing neither approach but allowing the strengths to be maximised and the weaknesses minimised, employing the most beneficial method design.

Ethical Considerations

This study was granted full ethical approval by the ethics committee at Manchester Metropolitan University on 25th June 2015 ethics code 25.04.15(i), with an amendment for the use of interviews also awarded full ethical approval on 14th April 2016. The study had to conform to a set of principles which addresses how researchers and research should be conducted when dealing with participants and how to use the research in general. With regards to this study, further information was provided regarding children unable to provide their own consent and further ethical issues regarding this and how to manage them. All information sheets and ethical forms were developed with the senior management team.

Recruitment and The Research Sample

Patton (1990) explains that quantitative data typically employs a large sample size and qualitative data is usually represented by a small sample size. A myriad of considerations has to be taken into deliberation when choosing the sample size, for instance, time constraints combined with a successful representation of the data. For this study, a larger sample size was chosen for the analysis of primary school children's

physical activity profiles and the PE teacher, class teacher and a small focus group of children were chosen for interviews regarding PE in the context of intensity, duration and child experience. Collins et al. (2006), describes a two-dimensional, mixed method sampling model, whereby, qualitative and quantitative data can be used concurrent (side by side) or sequentially (one after the other). For the purpose of this study sequentially has been used.

Upon commencing the study one school was selected for research due to time constraints, in turn adopting a case study design. The semi-rural primary school was chosen due to accessibility and reliability (fast response and good communication), alongside having a fully qualified coach who ran the physical education lessons.

From the outset, Key Stage 2 (KS2) children were the focus group for the study as they are of an age (8-10 years of age) where obesity levels are highest, currently between 26%-34% of children are overweight or obese. Whereas 20%-27% of children aged 2-7 years of age are classified as obese or overweight (Cancer Research UK, 2015). There was no specific criteria for children to take part so participation information sheets and consent forms were sent home with every pupil in KS2. The first class to receive all consent forms (Year 5) was the class that was selected and the first eight girls to return forms and the first eight boys to return forms were the sixteen pupils selected for analysis. As well as the first four girls forms to be returned and the first four boys forms to be returned were the children chosen for the focus group interview and the PE teacher and class teacher to be interviews one to one. This was the chosen randomised selection process to obtain an unbiased sample. It is advantageous to undertake these specific interviews with the selected participants as it will inform the study as to how children and teachers experience their time in PE and create links between the two types of data, drawing conclusions to if there is a disconnect between physical activity and what they are actually doing or children perceive they are doing.

Observational Analysis Development and Reliability

Of the sixteen children selected, participant profiles were to be retrieved and analysed to discover what children are doing in their PE lessons and to highlight and compare any gender differences that arise, the first process of the study will address research objective one. After extensive research into measuring physical activity the literature suggested that no pre-designed tool would be appropriate for this study. As Slyvia et al. (2015) explain, pedometers simply measure steps and accelerometers only measure acceleration and movement (Westerterp, 2009). Therefore, to attain greater depth information about children in physical education, activity alongside exertion needs to be recorded; this envisages a broader profile and allows reasoning to become apparent from the data.

For the purpose of the this study a systematic design was undertaken to create a dependable tool to be used in analysing physical activity. The tool was designed to take in to account the exertion level of the participant and to note what activity they were doing and whether they were on task (E.g. complying to the teacher's instructions) or off task (E.g. not doing what the teacher has asked). Initially METS Scale, measuring energy expenditure, was used to form the foundations of the tool. Alongside, Borg's (1982) perceived effort rating scale, which measures how hard the participant thinks they are working. Borg's effort rating scale, which numbers from six to twenty, with 6 representing 'no feeling of exertion' and 20 representing 'very very hard exertion' and all in-between numbers categorised with a description of exertion, was incorporated into the design. Borg's scale was manipulated and simplified to create an exertion scale from zero to ten, with ten been 'very high' and zero been 'static', one to three 'low', four to six 'moderate' and seven to nine 'high'. These descriptions overarched individual categorised activities, and against each number different activities were placed which matched the exertion level employed by the participants. Some categories for instance, walking, span over three numbers (1, 2 and 3) this was because there are various types of walking and each have different exertion levels (stroll, power, brisk). The observational system was designed to be used by

either live coding or post coding participants in PE, with each time interval recording a level of exertion. This meant that the data could be analysed at the precise time of the event, however, only one person could be observed. If more than one person needed to be observed then the event could be recorded. Therefore, coding would take place after the event and all participants could be observed and analysed. For the purpose of this study that is what happened.

Table 1 Descriptive table of system design one.

Rating	Description	Example
0	Zero physical exertion	Standing still
1	Very slight physical exertion	Stretching
2	Slight physical exertion	Circling arms
3	Fairly light exertion	Brisk walk
4	Light exertion	Steady jog
5	Fairly moderate exertion	Hopping
6	Moderate exertion	Skipping
7	Fairly high exertion	Jumping
8	High exertion	Fast run
9	Very high exertion	Sprint
10	Very very high exertion	Full sprint

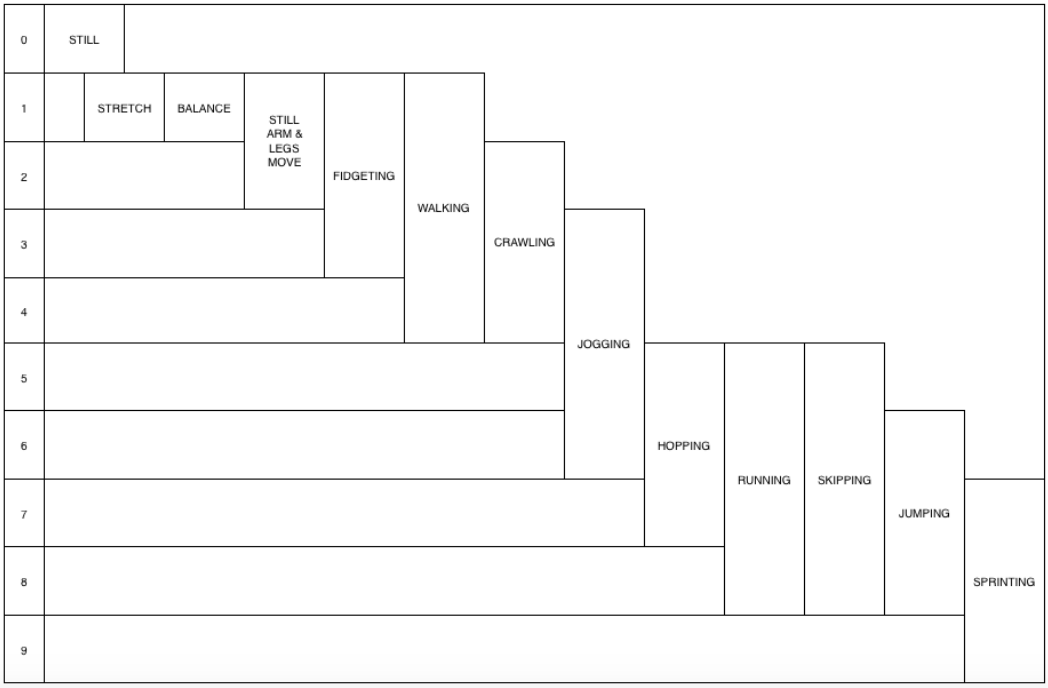

Figure 2 System Design One

Table 1. and figure 2. were the initial design process for assessing children's physical activity in PE lessons. Although the tool was designed around established models, it is acknowledged that the reliability process is a crucial component of content analysis and vital to be able to produce faultless reproducibility (Krippendorff, 2004). Without validating the system, any data produced could be deemed meaningless and may be justifiably doubted or even considered incoherent (Lombard et al, 2004). The system was tested by inter-observer reliability which was achieved by myself and another research student duplicating the process of analysing the same set of data. Intra-observer reliability was tested to further validate the designed system. To accomplish this the same set of data was analysed six times by a single coder and concluded with the same result (Gwet, 2008). By achieving a high level of inter-observer reliability this enables a practical benefit, as the work load could be divided between many different analysts to decrease the time spent coding (De Wever, 2006) Alongside this, intra-observer reliability is advantageous as the data produced will generate accurate feedback and high levels of consistency (O'Donoghue, 2007). However, some observation studies have taken in to account observer fatigue (Jones et al., 2002), and concluded that by doing several hours work observing data, exhaustion may become apparent and therefore allow errors to accumulate.

Table 2 Reliability score for Cohen's Kappa, Scott;s Pi, Krippendorff's Alpha and percentage agreement for system design one

	Intra-observer			Inter-observer		
	Cohen's Kappa					
3 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.601	0.861	0.927	0.061	0.097	0.457
	Scott's Pi					
3 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.601	0.861	0.927	0.027	0.072	0.452
	Krippendorff's Alpha					
3 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.606	0.863	0.928	0.039	0.084	0.459
	Percentage Agreement					
3 Seconds	T1	T2	T3	T1A	T1B	T1C
	72.5	90	95	27.5	35	60
	Cohen's Kappa					
6 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.922	0.925	1	0.174	0.188	0.709
	Scott's Pi					
6 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.922	0.924	1	0.112	0.163	0.705
	Krippendorff's Alpha					
6 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.924	0.926	1	0.133	0.184	0.713
	Percentage Agreement					
6 Seconds	T1	T2	T3	T1A	T1B	T1C
	95	95	100	33.3	45	80
	Cohen's Kappa					
9 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.791	1	1	0.309	0.349	0.691
	Scott's Pi					
9 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.789	1	1	0.277	0.328	0.69
	Kripendorff's Alpha					
9 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.796	1	1	0.303	0.352	0.701
	Percentage Agreement					
9 Seconds	T1	T2	T3	T1A	T1B	T1C
	85.7	100	100	42.9	57.1	78.6
	Cohen's Kappa					
12 Seconds	T1	T2	T3	T1A	T1B	T1C
	1	1	1	0.25	0.483	0.655
	Scott's Pi					
12 Seconds	T1	T2	T3	T1A	T1B	T1C
	1	1	1	0.237	0.474	0.655
	Kripendorff's Alpha					
12 Seconds	T1	T2	T3	T1A	T1B	T1C
	1	1	1	0.272	0.5	0.672
	Percentage Agreement					
12 Seconds	T1	T2	T3	T1A	T1B	T1C
	100	100	100	45.5	70	80

An agreement score of 0.90 and above is viewed as almost perfect in agreement. As Lombard (2004) explains, preliminary reliability scores may not be adequate and the need to redefine may be fitting, thus highlighting the reason for numerous tries (T1, T2, T3), however in this instance the need for redevelopment of the tool was apparent as consistently none of the scores were over 0.90 for the inter-observer reliability. Therefore, the system design consisted of two phases. Phase one depicted many problems which can be seen in the reliability results (Table 2). The initial system was too complex: by having several categories at a high exertion level made it challenging for both coders to agree on a score. Also, overarching categories were added to increase simplicity to the coder, who was able to identify the correct exertion level faster and more accurately. In addition to this, to make the tool unique and for greater depth analysis it was significant to know what was happening when a participant was coded at that level. Three important categorises were devised to underpin what a participant could be doing in a physical education lesson; they were: Skill Development (K), Direct Learning (L), Playing Sport (S). Finally, to understand whether the participant was on task (✓) or off task (✗) was important as this would imply if the PE lesson was impacting upon their engagement to be physically active. Therefore, at each time interval an exertion level, an activity category and finally interaction level needed to be recorded, for example, 6S✓ (Exertion level 6, taking part in a sporting activity and on task).

Table 3 Descriptive table of system design two.

Over-arching category	Rating	Description	Example
Static	0	Zero physical exertion	Standing still
Low	1	Very slight physical exertion	Stretching
	2	Slight physical exertion	Circling arms
	3	Fairly light exertion	Brisk walk
Moderate	4	Light exertion	Steady jog
	5	Fairly moderate exertion	Hopping
	6	Moderate exertion	Skipping
High	7	Fairly high exertion	Jumping
	8	High exertion	Fast run
	9	Very high exertion	Sprint
Very High	10	Very very high exertion	Full sprint
	On Task (✓)	Following instructions	Sitting listening
	Off Task (✗)	Not following instructions	Chatting to friends
	Skill Development (K)	Activities that broaden knowledge base and the practising of motor skills	Throwing and catching the ball with a partner
	Direct Learning (L)	Teacher based interaction	Watching a demonstration
	Playing Sport (S)	Participating in the sport	Playing a game of football

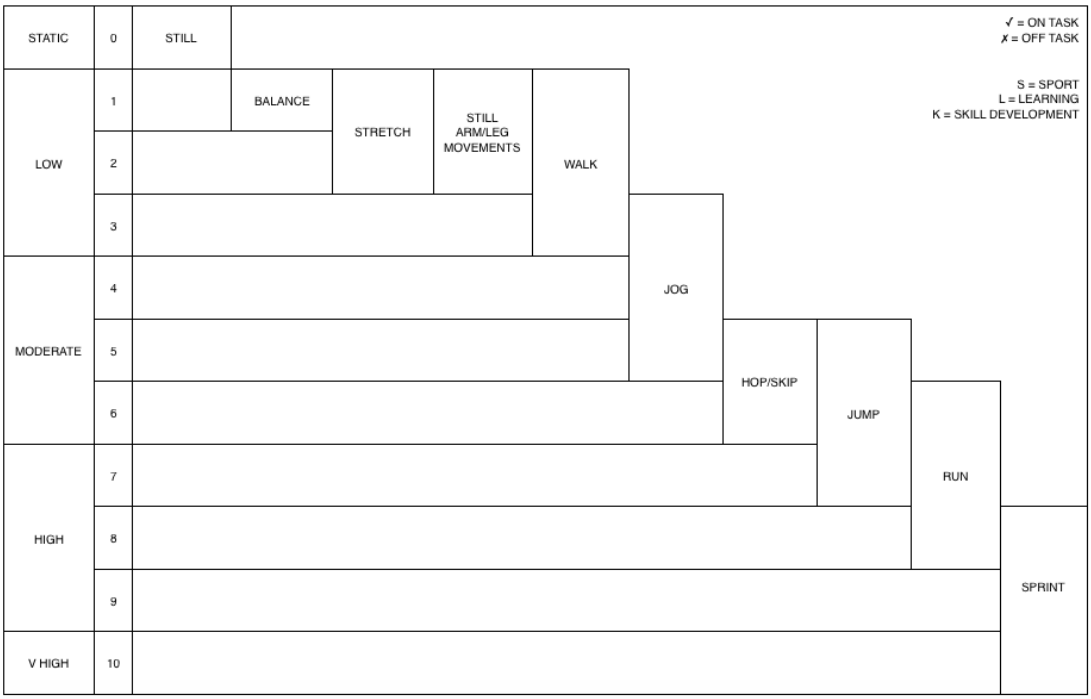

Figure 3 System Design Two

Table 4 Reliability score for Cohen's Kappa, Scott's Pi, Krippendorff's Alpha and percentage agreement for system design two.

	Intra-observer			Inter-observer		
	Cohen's Kappa					
3 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.854	0.982	0.982	0.807	0.889	0.828
	Scott's Pi					
3 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.854	0.982	0.982	0.807	0.889	0.828
	Krippendorff's Alpha					
3 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.855	0.982	0.982	0.808	0.889	0.829
	Percentage Agreement					
3 Seconds	T1	T2	T3	T1A	T1B	T1C
	90.6	98.8	98.8	89.8	89.5	89.3
	Cohen's Kappa					
6 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.963	1	1	0.925	0.963	0.924
	Scott's Pi					
6 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.963	1	1	0.925	0.963	0.924
	Krippendorff's Alpha					
6 Seconds	T1	T2	T3	T1A	T1B	T1C
	0.963	1	1	0.926	0.963	0.925
	Percentage Agreement					
6 Seconds	T1	T2	T3	T1A	T1B	T1C
	97.5	100	100	95	97.5	95
	Cohen's Kappa					
9 Seconds	T1	T2	T3	T1A	T1B	T1C
	1	1	1	0.947	0.889	0.889
	Scott's Pi					
9 Seconds	T1	T2	T3	T1A	T1B	T1C
	1	1	1	0.946	0.889	0.889
	Kripendorff's Alpha					
9 Seconds	T1	T2	T3	T1A	T1B	T1C
	1	1	1	0.947	0.891	0.891
	Percentage Agreement					
9 Seconds	T1	T2	T3	T1A	T1B	T1C
	100	100	100	96.3	92.6	92.6
	Cohen's Kappa					
12 Seconds	T1	T2	T3	T1A	T1B	T1C
	1	1	1	1	1	1
	Scott's Pi					
12 Seconds	T1	T2	T3	T1A	T1B	T1C
	1	1	1	1	1	1
	Kripendorff's Alpha					
12 Seconds	T1	T2	T3	T1A	T1B	T1C
	1	1	1	1	1	1
	Percentage Agreement					
12 Seconds	T1	T2	T3	T1A	T1B	T1C
	100	100	100	100	100	100

After the redevelopment of the tool, the above scores are deemed as acceptable. However, judging solely on the reliability of the tool is not justifiable as the data from activity is also relevant. To code an individual every twelve seconds is most reliable, however, it also accumulates with the least amount of data for activity. Therefore, reliability and data extracted needs to be combined to achieve the most accurate and precise results. As the tool is designed for post and live coding, it would not be achievable to code the participant every second, however this would get the most accurate data (gold standard). A reliability analysis needed to be undertaken to find out when would be the most accurate and appropriate time interval to code. A two-minute gold standard coding template of every second was compared to a live code of every three seconds, six seconds, nine seconds and twelve seconds to compare the difference in data produced (table 4).

Table 5 Table of accuracy for coding 3 seconds, 6 seconds, 9 seconds and 12 seconds against full time motion analysis (gold standard)

	Full time motion analysis		3 Seconds			6 Seconds			9 Seconds			12 Seconds		
Exertion Level	X	%	X	%	Error	X	%	Error	X	%	Error	X	%	Error
0	64	53%	20	50%	-3%	10	50%	-3%	6	45%	-8%	5	50%	-3%
1														
2	8	7%	3	8%	+1%	1	5%	-2%	2	15%	+8%	1	10%	+3%
3	4	3%	2	5%	+2%	2	10%	+7%	1	8%	+5%	0	0%	-3%
4	13	11%	5	12%	+1%	2	10%	-1%	2	15%	+4%	1	10%	-1%
5														
6	28	23%	9	22%	-1%	5	25%	+2%	2	15%	-8%	3	30%	+7%
7	3	3%	1	3%	0	0	0%	-3%	0	0%	-3%	0	0%	-3%
8														
9														
10														
Total	*120*	*100%*	*40*	*100%*	*8%*	*20*	*100%*	*18%*	*13*	*98%*	*36%*	*10*	*100%*	*20%*

As Table 5 shows an error percentage of only 8% for coding every 3 seconds this is the most accurate time, however when combined with the intra and inter-observer reliability results it is noticeable that coding everything 3 seconds did not get a reliability score of over 0.90 for inter-observer reliability. Therefore, the optimal time, combining reliability and extracted data for context, is to code every 6 seconds. Therefore, the tool designed, ELAP (Exertion Level and Activity Profiling), is a tool that could be used for live and post coding to asses a participant's exertion level, activity and interaction in physical education lessons coded every six seconds.

Interview Development

To satisfy research aim number two, semi-structured face-to-face interviews were conducted with the PE teacher, class teacher and a focus group with selected children. Semi-structured interviews were chosen to allow freedom to probe and investigate particular answers of interest in greater depth. According to Gray (2014), this allows the interviewer to focus on particular outcomes by following a standard set of questions, with the intention of expanding on particular answers. A realistic approach was undertaken when developing the interviews as Pawson and Tilley (1997), explain that it is vital to combine semi-structured interviews to a realist evaluation as the studies second objective is to explore reality from experiences. The questions for the interview schedule were based on three main elements for physical education:

1. **Intensity** – Exploring how hard children work in PE, how they feel before, during and after
2. **Duration** – Discovering how long children take part in physical education in the session and on a weekly basis (related to government guidelines)
3. **Experiences** – Asking children/teachers to relive physical education lessons and explain their thoughts and perceptions through lived experiences

Thus, intending to further develop the analyses of the quantitative data by relating the numbers to experiences and qualitative answers. In addition, the three guiding

elements to the interviews, outlined above, recognise the context in which physical education may be subjected.

The researcher conducted all the interviews over the time frame for the data collection (September 2015 – July 2016, see figure 4.) as this was when access to the school had been granted. The interviews for the PE and class teacher were 1-to-1 and the interview with the children was a focus group including six children, three girls and three boys. The interviews took place at pre-arranged times that did not disrupt the normal school day and they were recorded via a Dictaphone and transcribed at a later date. The children were chosen to be interviewed in a focus group as research suggests that this relaxes children and increases the chance of honest answers, alongside keeping them in a familiar environment. By using a selection of participants for the interviews gave greater perspective in order for the evaluator to draw re-current themes and theories for the three main elements.

'Pilot Test First'

For the purpose of this study, the pilot interviews were designed as small scale interviews seen as *trial runs* in preparation for the main study (Teijlingen and Hundley, 2001). As De Vaus explains '… do not take the risk, pilot test first' (1993:54), this implies by undertaking a pilot interview issues are highlighted prior to the study, it gives advance warning about where the interview might fail and finally these can be addressed and therefore, will not affect the research data.

Following the pilot interviews limitations were illustrated. To overcome theses, in the focus group, it will be emphasised that children give honest answers. It is explained that their answers are private and confidential and only myself and the research team will look at them. Furthermore, avoiding closed questions. It is vital to leave time for the interviewee to complete their answer to the question and only probe if necessary. This will enable greater depth answers and not inform the interviewee at any point.

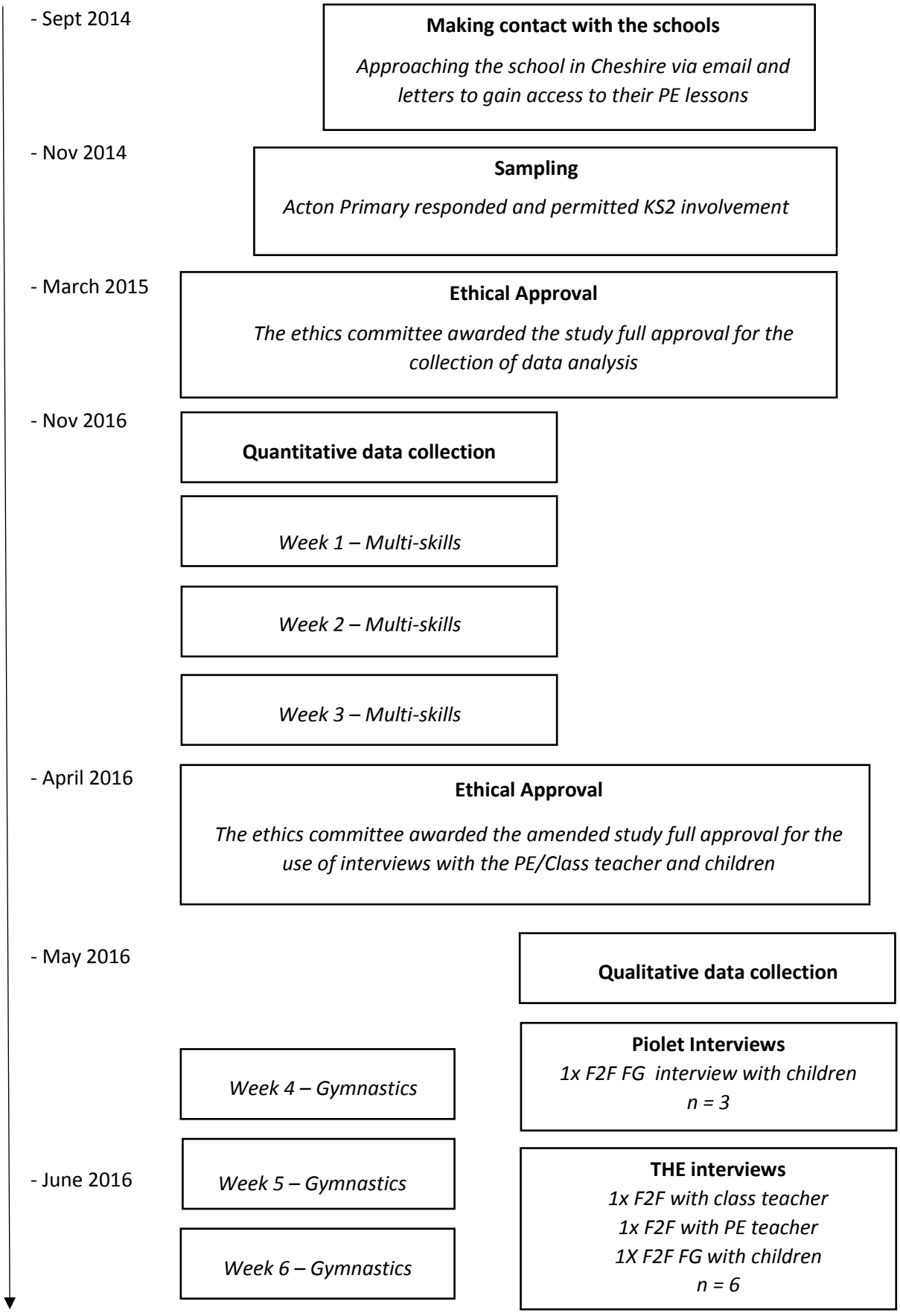

Figure 4 Figure 4. Timeline of data collection

Key: **F2F –** face to face **FG** – Focus Group

Making sense of the interviews

There are many different forms of analysis available for interpreting interview data but for this study what the participants have to say it most valuable, therefore, coming from a realist philosophical position (Langdridge, 2007), which adopts Interpretative phenomenological analysis (IPA). This theory is principally concerned about understanding the participants 'lived experiences' of physical education from their own position.

A full verbatim transcription was undertaken. Langdridge (2004) suggests that this initial step helps the researcher become closely familiar with the data. Research has suggested that transcribing interviews verbatim is time consuming, however, as there were only three interviews, lasting around forty minutes each, the limitations of transcribing word-for-word were reduced. Once all three interviews had been transcribed they were subjected to a thematic analysis (King and Horricks, 2010). Identifying themes is a distinctive procedure, first identifying information that will harvest useful discussion, but as King and Horrocks (2010) explain, acknowledging some degree of repetition is needed to ensure a distinct theme. However, vital information should not be dismissed if it only appears once, though this cannot be called a theme it may still be used in discussion. Descriptive codes were highlighted throughout each interview and brief comments were attached. Second the descriptive codes were grouped with a common meaning and the codes were interpreted relating to the research aim they were addressing. Finally overarching themes were derived from the whole set of data with the project aims in mind.

While the interviews were analysed thematically through IPA in accordance with King and Horrocks (2010), this did not limit themes to just 'lived experiences'. The data collated also highlighted other significant themes which related to children's perceived perceptions of PE. This qualitative data collected could help explain some of the quantitative data produced. Therefore, the data could not be dismissed and another avenue was explored to further enhance the discussion. This is distinguished in each interview thematic map by IPA and perceived perceptions.

Chapter 6 Quantitative analysis: activity profiles

Physical activity profiles during Physical Education classes

Table 6 Mean (+SD) Physical Activity Profiles by Gender

Variable	Males	Females	All Students
Total Exertion	534.2 (275.3)	441.6 (205.8)	487.9 (246.2)
Exertion/s	0.30 (0.15)	0.25 (0.11)	0.27 (0.13)
Exertion Quotient (EQ)	17.1 (9.0)	14.8 (6.6)	16.2 (7.9)
EQ/Kg	0.56 (0.29)	0.47 (0.23)	0.52 (0.27)
% Static Activity	36.2 (12.7)	43.6 (11.9)	39.9 (12.8)
% Low Activity	30.2 (10.2)	29.5 (8.2)	29.8 (9.2)
% Moderate Activity	26.2 (9.7)	21.8 (9.9)	24.0 (10.0)
% High Activity	7.5 (5.5)	5.2 (4.6)	6.3 (5.2)
% V High Activity	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
	534.2 (275.3)	441.6 (205.8)	487.9 (246.2)

Table 7 Mean (+SD) Physical Activity Profiles by Class Type

Variable	Multi-skills	Gymnastics	All Classes
Total Exertion	692. 3 (187.3)	282.9 (39.1)	487.9 (246.2)
Exertion/s	0.38 (0.09)	0.16 (0.2)	0.27 (0.13)
Exertion Quotient (EQ)	23.0 (5.6)	9.5 (1.3)	16.2 (7.9)
EQ/Kg	0.73 (0.21)	0.30 (0.06)	0.52 (0.27)
% Static Activity	34.4 (13.7)	45.4 (9.1)	39.9 (12.8)
% Low Activity	34.7 (13.7)	25.0 (7.3)	29.8 (9.2)
% Moderate Activity	21.5 (9.6)	26.5 (9.9)	24.0 (10.0)
% High Activity	9.5 (4.9)	3.1 (3.0)	6.3 (5.2)
% V High Activity	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Table 8 Mean (+SD) Physical Activity Profiles by Class Type by Gender

	Multi-skills			Gymnastics			All Classes		
	Male (n =48)	**Female (n =48)**	**All Students (n =96)**	**Male (n =48)**	**Female (n =48)**	**All Students (n =96)**	**Male (n =48)**	**Female (n =48)**	**All Students (n =96)**
Total Exertion	777.2 (174.6)	608.7 (162.5)	692. 3 (187.3)	291.2 (33.4)	274.6 (43.2)	282.9 (39.1)	534.2 (275.3)	441.6 (205.8)	487.9 (246.2)
Exertion/s	0.43 (0.08)	0.34 (0.82)	0.38 (0.09)	0.16 (0.2)	0.16 (0.3)	0.16 (0.2)	0.30 (0.15)	0.25 (0.11)	0.27 (0.13)
Exertion Quotient (EQ)	25.7 (4.9)	20.3 (4.9)	23.0(5.6)	9.7 (1.1)	9.3 (1.5)	9.5 (1.3)	17.1 (9.0)	14.8 (6.6)	16.2 (7.9)
EQ/Kg	0.82 (0.19)	0.65 (0.20)	0.73 (0.21)	0.31 (0.06)	0.30 (0.06)	0.30 (0.06)	0.56 (0.29)	0.47 (0.23)	0.52 (0.27)
% Static Activity	27.6 (9.8)	41.2 (13.8)	34.4 (13.7)	44.8 (8.9)	46.0 (9.4)	45.4 (9.1)	36.2 (12.7)	43.6 (11.9)	39.9 (12.8)
% Low Activity	36.3 (8.8)	33.1 (7.7)	34.7 (13.7)	24.1 (7.5)	26.0 (7.1)	25.0 (7.3)	30.2 (10.2)	29.5 (8.2)	29.8 (9.2)
% Moderate Activity	24.5 (10.1)	18.5 (8.1)	21.5 (9.6)	28.0 (9.3)	25.1 (10.5)	26.5 (9.9)	26.2 (9.7)	21.8 (9.9)	24.0 (10.0)
% High Activity	11.7 (3.9)	7.4 (5.0)	9.5 (4.9)	3.2 (3.0)	3.0 (3.0)	3.1 (3.0)	7.5 (5.5)	5.2 (4.6)	6.3 (5.2)
% V High Activity	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Inferential Analyses

Total time in exertion for physical education classes

For estimated total exertion a significant class type main effect was identified ($F(1,14) = 389.804$, $p < .0005$, $\eta_p^2 = .965$), boys exhibiting higher levels of exertion than girls (table 8). In addition a significant gender main effect was identified for this variable ($F(1,14) = 14.379$, $p = .002$, $\eta_p^2 = .507$). Moreover, total physical activity a gender x class type interaction was identified ($F(1,14) = 14.708$, $p = .002$, $\eta_p^2 = .512$) with boys exerting higher levels of physical exertion particularly in multi-skills with little difference in total exertion in gymnastic type classes.

Total time in exertion in static activity

For estimated total exertion in static activity a significant class type main effect was identified ($F(1,14) = 46.461$, $p < .0005$, $\eta_p^2 = .768$), girls displaying higher levels of static activity than boys (table 8). In addition a significant gender main effect was identified for this variable ($F(1,14) = 9.426$, $p = .008$, $\eta_p^2 = .402$). In addition, total physical activity a gender x class type interaction was identified ($F(1,14) = 10.260$, $p = .006$, $\eta_p^2 = .423$) with girls displaying higher levels of static behaviour particularly in multi-skills.

Total time in exertion in low activity

For estimated total exertion in low activity a significant class type main effect was identified ($F(1,14) = 49.497$, $p < .0005$, $\eta_p^2 = .780$), boys displaying higher levels of low activity than girls (table 8). There was not a significant gender main effect identified for this variable ($F(1,14) = .111$, $p = .744$, $\eta_p^2 = .008$). However, total physical activity a gender x class type interaction was identified ($F(1,14) = 4.621$, $p = .050$, $\eta_p^2 = .248$) with boys displaying higher levels of low activity than girls in multi-skills and girls displaying higher levels of low activity than boys in gymnastics.

Total time in exertion in moderate activity

For estimated total exertion in moderate activity a significant class type main effect was not identified ($F(1,14) = 1.531$, $p < .236$, $\eta_p^2 = .099$). Nor was there a significant gender main effect identified for this variable ($F(1,14) = 4.052$, $p = .064$, $\eta_p^2 = .224$). As well as, total physical activity a gender x class type interaction not been identified ($F(1,14) = .290$, $p = .599$, $\eta_p^2 = .020$).

Total time in exertion in high activity

For estimated total exertion in high activity a significant class type main effect was identified ($F(1,14) = 52.626$, $p < .0005$, $\eta_p^2 = .790$), boys exhibiting higher levels of exertion than girls (Table 8). In addition a significant gender main effect was identified for this variable ($F(1,14) = 9.689$, $p = .008$, $\eta_p^2 = .409$). As well as, total physical activity a gender x class type interaction was identified ($F(1,14) = 7.889$, $p = .014$, $\eta_p^2 = .360$) with boys exerting higher levels of physical exertion in high activity particularly in multi skills with little difference in total exertion in gymnastic type classes.

Profiling 'on task' and 'off task' behaviour during Physical Education Class

Table 9 Mean (±SD) Physical Activity Profiles by Class Type by Gender

	Multi-skills			Gymnastics			All Classes		
Mean (STDEV) All to 1 decimal place	**Male (n =48)**	**Female (n =48)**	**All Students (n =96)**	**Male (n =48)**	**Female (n =48)**	**All Students (n =96)**	**Male (n =48)**	**Female (n =48)**	**All Students (n =96)**
% Off Task	11.4 (4.1)	10.2 (4.6)	10.8 (4.3)	11.4 (3.7)	9.1 (3.6)	10.2 (3.8)	11.4 (3.9)	9.7 (4.1)	10.5 (4.1)
% On Task	88.6 (4.1)	89.8 (4.6)	89.2 (4.3)	88.6 (3.7)	90.9 (3.6)	89.8 (3.8)	88.6 (3.9)	90.3 (4.1)	89.5 (4.1)
% Sport	18.8 (5.8)	16.8 (7.4)	17.8 (6.6)	25.5 (3.5)	24.1 (5.6)	24.8 (4.7)	22.1 (5.8)	20.5 (7.5)	21.3 (6.7)
% Skill	48.2 (10.9)	50.0 (13.4)	49.1 (12.1)	31.1 (4.0)	33.1 (4.0)	32.1 (4.1)	39.7 (11.9)	41.5 (13.0)	40.6 (12.4)
% Learning	21.6 (5.6)	23.0 (5.5)	22.3 (5.5)	32.0 (3.0)	33.7 (3.4)	32.8 (3.3)	26.8 (6.9)	28.4 (7.0)	27.6 (7.0)
Off Task Static	43.4 (18.4)	56.3 (17.8)	49.9 (19.1)	34.0 (14.1)	40.7 (17.5)	37.4 (16.1)	38.7 (16.9)	48.5 (19.2)	43.6 (18.6)
Off Task Low	20.4 (11.5)	27.6 (12.2)	24.0 (12.3)	24.6 (14.4)	31.3 (15.9)	27.9 (15.4)	22.5 (13.1)	29.4 (14.2)	26.0 (14.0)
Off Task Mod	27.6 (16.9)	15.4 (18.7)	21.5 (18.7)	36.2 (19.6)	25.5 (20.1)	30.9 (20.4)	31.9 (18.6)	20.5 (19.9)	26.2 (20.0)
Off Task High	8.6 (10.5)	0.7 (1.9)	4.7 (8.5)	5.1 (5.6)	2.5 (4.9)	3.8 (5.4)	6.9 (8.5)	1.6 (3.8)	4.2 (7.1)
On Task Static	22.7 (6.9)	24.6 (6.3)	23.6 (6.6)	34.6 (3.3)	35.7 (4.6)	35.1 (4.0)	28.6 (8.1)	30.1 (7.8)	29.4 (7.9)
On Task Low	12.4 (6.5)	19.2 (11.3)	15.8 (9.8)	11.1 (6.7)	13.3 (7.1)	12.2 (6.9)	11.7 (6.6)	16.2 (9.8)	14.0 (8.6)
On Task Mod	45.8 (9.8)	45.2 (10.4)	45.5 (10.0)	49.9 (5.4)	46.2 (6.2)	48.0 (6.0)	47.8 (8.1)	45.7 (8.5)	46.8 (8.3)

On Task High	18.7 (10.3)	11.0 (7.5)	14.9 (9.7)	4.5 (3.5)	4.8 (3.9)	4.7 (3.7)	11.6 (10.5)	7.9 (6.7)	9.8 (8.9)
Sport Static	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Sport Low	0.0 (0.0)	0.1 (0.7)	0.1 (0.5)	4.7 (7.5)	9.0 (13.5)	6.8 (11.0)	2.3 (5.7)	4.6 (10.5)	3.5 (8.5)
Sport Mod	64.3 (26.0)	75.9 (24.5)	70.1 (25.7)	86.4 (10.7)	82.9 (12.8)	84.7 (11.8)	75.4 (22.6)	79.4 (19.7)	77.4 (21.2)
Sport High	35.7 (26.0)	24.0 (24.6)	29.8 (25.7)	8.9 (9.4)	8.0 (7.0)	8.5 (8.2)	22.3 (23.6)	16.0 (19.6)	19.2 (21.8)
Skill Static	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Skill Low	19.4 (9.8)	30.9 (15.6)	25.2 (14.2)	23.3 (13.7)	26.3 (12.2)	24.8 (12.9)	21.4 (12.0)	38.6 (14.0)	25.0 (13.5)
Skill Mod	60.1 (12.9)	56.0 (16.1)	58.0 (14.5)	71.2 (13.1)	66.3 (9.9)	68.8 (11.7)	65.6 (14.0)	61.2 (14.2)	63.4 (14.2)
Skill High	20.5 (11.2)	13.1 (10.4)	16.8 (11.3)	5.5 (4.8)	7.4 (6.9)	6.4 (6.0)	13.0 (11.4)	10.2 (9.2)	11.6 (10.4)
Learning Static	93.6 (4.9)	95.2 (3.5)	94.4 (4.3)	95.6 (2.4)	96.0 (3.6)	95.8 (3.0)	94.6 (3.9)	95.6 (3.5)	95.1 (3.8)
Learning Low	6.3 (4.9)	4.8 (3.5)	5.5 (4.3)	3.8 (2.0)	3.8 (3.4)	3.8 (2.7)	5.1 (3.9)	4.3 (3.4)	4.7 (3.7)
Learning Mod	0.1 (0.6)	0.0 (0.0)	0.1 (0.4)	0.6 (1.0)	0.3 (0.7)	0.4 (0.9)	0.3 (0.9)	0.1 (0.5)	0.2 (0.7)
Learning High	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

‘On task’ time during physical education classes

A main effect of Class Type for ‘on task’ time active was found to be significant ($F(1,14) = 53.3$, $p < .0005$, $\eta_p^2 = .79$) with greater time spent in sport activity in gymnastics classes (Table 9). A main effect of Gender for this variable was not significant ($F(1,14) = 1.31$, $p = .27$, $\eta_p^2 = .09$) and the Gender x Class Type interaction was not observed to be significant ($F(1,14) = 0.12$, $p = .733$, $\eta_p^2 = .009$).

Further examination of ‘on task’ time classified by the observed activity intensity (static; low; moderate; high) revealed no Gender or Class Type main effects or interactions for either static or low level of activity. A main effect of Class Type for ‘on task’ time’ at moderate level was found to be significant ($F(1,14) = 26.4$, $p < .0005$, $\eta_p^2 = .65$) with greater time spent in sport at a moderate level in gymnastics classes (Table 9). A main effect of Gender for this variable was not significant ($F(1,14) = .73$, $p = .406$, $\eta_p^2 = .050$). The interaction of these two factors was not observed to be significant ($F(1,14) = 3.61$, $p = .078$, $\eta_p^2 = .205$).

A significant main effect of Class Type for ‘on task’ time at high level was identified ($F(1,14) = 34.68$, $p < .0005$, $\eta_p^2 = .712$) with greater time spent in sport at a moderate level in multi-skills classes (Table 9). A main effect of Gender for this variable was not significant ($F(1,14) = 2.29$, $p = .401$, $\eta_p^2 = .141$). The interaction of these two factors was not observed to be significant ($F(1,14) = 1.12$, $p = .308$, $\eta_p^2 = .074$).

‘On task’ time in ‘directed learning’ activity during physical education classes

A main effect of Class Type for time spent in directed learning was found to be significant ($F(1,14) = 581.5$, $p < .0005$, $\eta_p^2 = .98$) with greater time spent in directed learning for gymnastics (Table 9). A main effect of Gender for this variable was not significant ($F(1,14) = 3.24$, $p = .09$, $\eta_p^2 = .19$). The Gender x Class Type interaction was not observed to be significant ($F(1,14) = 0.93$, $p = .77$, $\eta_p^2 = .007$).

Further examination was undertake to ascertain how directed learning affected the physical activity levels of the students within the different PE classes. For time spend inactive (static) no Class Type ($F(1,14) = .761$, $p < .398$, $\eta_p^2 = .05$), or Gender ($F(1,14)$

= .999, p = .335, η_p^2 = .067) main effects were identified. . The Gender x Class Type interaction was also not observed to be significant (F(1,14) = 1.01, p = .34, η_p^2 = .067).

Similarly no Class Type (F(1,14) = 1.508, p < .240, η_p^2 = .097), Gender (F(1,14) = .858, p = .370, η_p^2 = .058) main effects or interactions (F(1,14) = 1.082, p = .316, η_p^2 = .072) were observed for low activity levels.

A main effect of Class Type for time spent in directed learning at moderate level was found to be significant (F(1,14) = 7.348, p < .017, η_p^2 = .344) with greater time spent in directed learning at a moderate level in gymnastics (Table ?). With a gender (F(1,14) = .617, p = .445, η_p^2 = .042) and gender x class type (F(1,14) = .227, p = .641, η_p^2 = .016) interaction not observed as significant.

'On task' time in 'skill' activity during physical education classes

A main effect of Class Type for time spent in skill based activity was found to be significant (F(1,14) = 384.36, p < .0005, η_p^2 = .965) with greater time spent in skill based activity for multi-skills (Table 9). A main effect of Gender for this variable was not significant (F(1,14) = 3.194, p = .096, η_p^2 = .186). The Gender x Class Type interaction was not observed to be significant (F(1,14) = .012, p = .914, η_p^2 = .001).

Furthermore, examination took place to establish how skill based activity affected the different physical education classes. For time spent at low level activity no Class Type (F(1,14) = .034, p < .857, η_p^2 = .002), or Gender (F(1,14) = 3.228, p = .094, η_p^2 = .187) main effects were identified. The Gender x Class Type interaction was observed to be significant (F(1,14) = 4.704, p = .048, η_p^2 = .252) with girls displaying higher levels of activity in multi-skills and boys displaying higher levels of activity in gym.

A main effect of Class Type for time spent in skill based activity was found to significant for moderate level activity (F(1,14) = 28.611, p < .0005, η_p^2 = .671) and high activity (F(1,14) = 59.657, p < .0005, η_p^2 = .810) with gymnastics having the greater time at moderate level and multi-skills having greater time spent at high level. For both moderate and high levels of activity a main effect of gender was not

significant ($F(1,14) = 2.285$, $p = .153$, $\eta_p^2 = .140$) ($F(1,14) = .937$, $p = .349$, $\eta_p^2 = .063$). However a gender x class type interaction was observed for high levels of activity ($F(1,14) = 6.627$, $p = .022$, $\eta_p^2 = .321$) with boys having higher levels of activity in multi-skills than girls and girls having higher levels of activity in gym than boys.

'On task' time in 'sport' activity during physical education classes

A main effect of Class Type for on task time active in sport was found to be significant ($F(1,14) = 53.3$, $p < .0005$, $\eta_p^2 = .79$) with greater time spent in sport activity in gymnastics classes (Table 9). A main effect of Gender for this variable was not significant ($F(1,14) = 1.31$, $p = .27$, $\eta_p^2 = .09$). The interaction of these two factors was not observed to be significant ($F(1,14) = 0.12$, $p = .733$, $\eta_p^2 = .009$).

Further examination was undertaken to ascertain how different PE lessons effect different levels of exertion in sport based activities. At moderate level, greater time was found to be spent in gymnastic classes as a main effect of class type was found to be significant ($F(1,14) = 34.68$, $p < .0005$, $\eta_p^2 = .712$). However no gender ($F(1,14) = 2.29$, $p = .401$, $\eta_p^2 = .141$) or gender x class type ($F(1,14) = 0.93$, $p = .77$, $\eta_p^2 = .007$) was found to be significant.

A main effect of Class Type for on task time active in sport at high level was found to be significant ($F(1,14) = 34.68$, $p < .0005$, $\eta_p^2 = .712$) with greater time spent in sport at a moderate level in multi-skills classes (Table 9). A main effect of Gender for this variable was not significant ($F(1,14) = 2.29$, $p = .401$, $\eta_p^2 = .141$). The interaction of these two factors was not observed to be significant ($F(1,14) = 1.12$, $p = .308$, $\eta_p^2 = .074$).

'Off Task' time during physical education classes

A main effect of Class Type for time spent 'off task' was found to be not significant ($F(1,14) = .017$, $p < .897$, $\eta_p^2 = .001$). A main effect of Gender for this variable was not

significant ($F(1,14) = 2.947$, $p = .108$, $\eta_p^2 = .174$). The Gender x Class Type interaction was not observed to be significant ($F(1,14) = .941$, $p = .349$, $\eta_p^2 = .063$).

Further examination of 'off task' time classified by the observed activity intensity (static; low; moderate; high) revealed that A main effect of Class Type for time spent in off task static activity was found to be significant ($F(1,14) = 8.440$, $p < .012$, $\eta_p^2 = .376$) with greater time spent in off task static activity for multi-skills (Table 9). A main effect of Gender for this variable was not significant ($F(1,14) = 2.198$, $p = .160$, $\eta_p^2 = .136$). The Gender x Class Type interaction was not observed to be significant ($F(1,14) = .687$, $p = .421$, $\eta_p^2 = .047$).

In 'off task' behaviour at low level exertion a main effect of Gender for this variable was found to be significant ($F(1,14) = 7.986$, $p = .013$, $\eta_p^2 = .363$) with girls displaying the most time in low exertion for off task activity in both gymnastics and multi-skills (Table 9). A main effect of Class Type was not found to be significant ($F(1,14) = 1.217$, $p < .288$, $\eta_p^2 = .080$) as well as Gender x Class Type interaction not observed to be significant ($F(1,14) = .000$, $p = .983$, $\eta_p^2 = .000$).

A main effect of Class Type for time spent in off task high activity was not found to be significant ($F(1,14) = .127$, $p < .727$, $\eta_p^2 = .009$). However, a main effect of Gender for this variable was found to be significant ($F(1,14) = 5.761$, $p = .031$, $\eta_p^2 = .292$) with boys displaying the most time in high exertion for off task activity in both gymnastics and multi-skills. The Gender x Class Type interaction was not observed to be significant ($F(1,14) = 3.753$, $p = .073$, $\eta_p^2 = .$

Chapter 7 physical activity in children: a phenomenological analysis

Introduction

The purpose of the interviews was to understand the extent to which Physical Education impacts on physical activity through the eyes of the PE teacher, the class teacher and the children. Using a phenomenological analysis, insights into the participants lived experiences can be explored (Husserl, 2013). While the main appraisal of the participant experiences was captured using interpretative phenomenological analysis, other significant information emerged that could not be dismissed. Consequently, some of the participant's perceptions of physical activity and physical education were included in this analysis. This also provided further opportunity to triangulate with the quantitative data. To include 'other data' is important otherwise a different account of the findings may be perceived. inclusion of perceived experiences as well as IPA will support the study (King and Horrocks, 2010).

This chapter will discuss and explain the themes drawn from the interviews and also look at any cross-case analysis by which distinction or similarities of the three interviews can be identified. Extracts of the interviews will be embedded into the following discussion with an analytical narrative that explains the meaning behind the data, posing discussion towards the research aim and related objectives (Braun and Clarke, 2006).

About the interviewees

Three interviews took place including the PE teacher, class teacher and six randomly selected students, at the request of all the participants, pseudonyms have been used to protect anonymity.

Both Mr Martin and Mr Baxter have worked at the selected school for over 12 months with Mr Martin employed as the PE coach and Mr Baxter a class teacher whom is required to take one hour of PE a week. Mr Martin has a physically active background, whilst working in schools as a PE teacher for the past six years, alongside still been involved in sport outside his working environment. On the other hand, Mr Baxter has been a classroom teacher for eight years with little background of physical activity, only ruby and kayaking from time-to-time.

The six children selected for interview were all from year 5, in Mr Baxter's class, who will be only distinguished by gender. Once a week, for sixty minutes on a Tuesday morning, the children have PE with Mr Martin and then again on a Friday afternoon with Mr Baxter. The observational analysis was conducted upon Mr Martin's PE lesson but at some points during interview Mr Baxter's PE lessons were referenced.

The overarching themes from analysis are illustrated in three separate thematic maps and related subthemes follow underneath. The overarching themes for each interview are as follows:

Child focus Group

- Understanding and experiencing the value of physical education
- Time spent in physical education
- Exertion levels in physical education

PE Teacher

- Foundations provided for physical education
- Environmental factors effecting physical activity

Classroom Teacher

- Physical education as a means for further academic achievement

Each theme will be isolated throughout the next chapter and discussed with cross reference between all three interviews with both experiences and perceived perceptions taken into consideration.

"Time Flies When You're Having Fun"

Children's perceptions of physical activity were at the forefront of the focus group interview, with children explaining how they knew PE should:

"…*teach us, give us a bright future and keep us healthy"* (Abbie, aged 9).

It is significant that children aged nine and ten are able to understand the long-term benefits of being physically active or at least report them. Interestingly, the children recognise the wider benefits of PE. In the above case, there acknowledgement of the social and educational potential of PE. The first over-arching theme is the children's understanding of the value of physical activity, highlighted in figure 5.

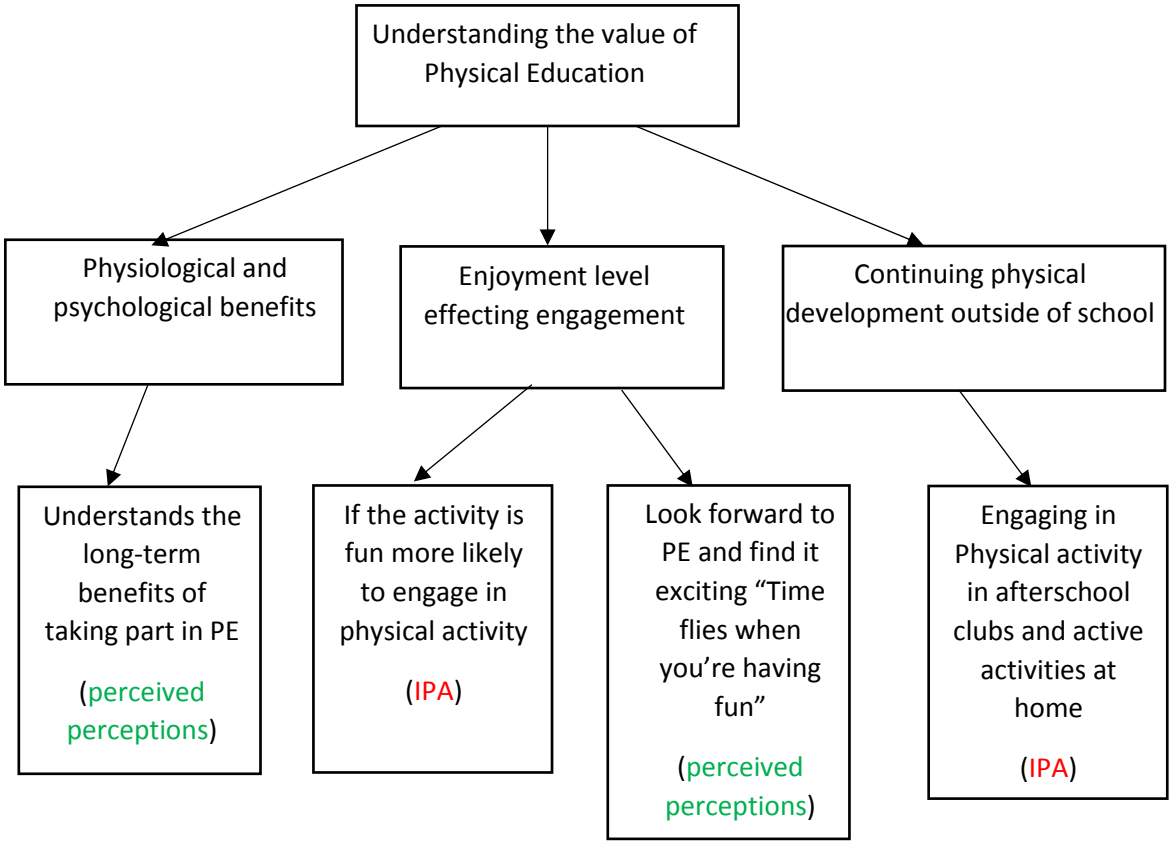

Figure 5 Thematic map for Understanding the value of physical education in child focus group interview

Taking part in PE has serval benefits, children recognised this as they specified that by engaging in physical activity helped gain advantageous health benefits and assisted in

adopting a healthy lifestyle that will continue when you get older. These long-term benefits are globalised day-to-day in the public eye and it is evident that people, of all ages, understand the impacts of participating in physical activity. Therefore, it is incredible that we still see so many children disengaged with PE and physical activity today. Supporting this, the results highlight that static activity during PE in both girls and boys was over double what was recorded in moderate levels of activity and over triple for high levels of activity. However, Mitchell et al (2015) have shown a positive association with enjoyment levels and engagement levels. Predominantly this has been recorded in teenage years, however, more recently it has been witnessed in primary years too. During the interview the children had a conversation regarding their experiences of time spent in PE:

> *Time flies when you're having fun* (Claire, aged 9)
>
> *Not every lesson, I don't think every lesson goes fast if it isn't fun, it depends what we're doing ... like when we're inside I can't run as fast as I can, but when I'm outside it's so much more fun so I can try harder* (Joe, aged 9).

This provides important contextual and environmental evidence, informing us that with high levels of enjoyment the more likely physical activity will take place. Whilst also considering that greater satisfaction can be attained when taking part in PE outside. Claire implies that PE lessons are over quickly as they are enjoyable, whereas Joe portrays that the enjoyment level determines how hard he is willing to work. The results highlight that significant gender differences are apparent when comparing class type (gymnastics and multi-skills), with boys spending more time in higher intensity activities in multi-skills than gymnastics. Whilst also presenting higher levels of off task behaviour than girls by substituting on task behaviour with more physically active off task activities.

The children that expressed enjoyment in PE reported that they attended afterschool clubs at school and in the community. The majority of the children that participated in afterschool clubs spoke about winning medals and/or competitions; this seemed to be the driving force for attendance, otherwise children would begin to disengage, as stated during the interview:

I go swimming, I've got lots of competitions (Theo, aged 9) ... *My mum wouldn't really let me do gymnastics, because next time I wouldn't even win a medal when I go because I've already got one* (Ruby, aged 10) ... *I used to go gymnastics and I won medals* (Abbie, aged 9).

This is important as it suggests that for some, external rewards and motivation may help engagement. Coupled with the issue of enjoyment, these are clear ways to improve engagement through a differentiated PE syllabus.

For the three boys at interview, football was the focal point. Two of the boys attended football clubs at school and clubs in the community too, whilst referring to football as *my life* (Theo, aged 9) the other boys also agreed that *football never gets boring* (Joe, aged 9) and *I can play football all day* (Callum, aged 10). However, Callum stated that after school clubs *do interest me but my mum can't pay,* therefore enforcing a limitation to engage in activity. Nonetheless, when later questioned about his choice of activities once he had finished school he explained that *he plays football at his house in the back garden*. Alongside this, the other children also reported their respective activities as outside those delivered in school:

I do twenty minutes on the trampoline (Ruby, aged 10)

... *I go on my scooter, my skateboard. I have an electric scooter what I sometimes go on. I go on my bike too and my trampoline and my slide* (Abbie, aged 9)

... *I go on my bike* (Joe, aged 9) ... *go outside on the trampoline for ten minutes* (Theo, aged 9).

... *I'd set up some training cones for football* (Joe, aged 9)

On Monday's, Wednesday's and Sunday's I run... to get to Cooksbit its half an hour, and to get back it's another half an hour. Me and my Dad tend to go there and back. (Claire, aged 9)

This implies that children go home and are active in the evening no matter what. When the children were probed about what they would do if it was raining, the majority still insisted that they would still go outside, explaining:

I would still go outside even if it was raining (Joe, aged 9) ...

I'll put my training waterproof coat on and still play football (Theo, aged 9) ...

... if it was, drizzle, I'd go running outside and get all my hair wet (Claire, 9)

Thus, implying that when these children go home they are physical active. Several research academics have explored into children's activity once leaving school and most recent researchers have specified modern technology is children's first choice of activity (Bucksch et al., 2014). Therefore, this contradicts what the children said. However, when gaming devices were mentioned children were very excitable and expressed how much they enjoyed to play on them. In actual fact, strict rules by parents seemed to be a deterrent from children playing on them every night of the week.

I'm only allowed ten minutes on it (Callum, aged 9)

... *I've got a time limit too* (Joe, aged 9) ...

I have a daily limit ... in the weekend, that's the only time that I'm allowed to play on the Xbox (Claire, aged 9) ...

Even when it's raining I'm still not allowed to go on (Abbie, aged 9)

I sneak on mine in the morning when my mum's asleep (Theo, aged 9)

... only Saturday's I'm allowed on mine... (Ruby, aged 10)

The children and parents seem to understand the benefit from limiting time on gaming devices as more recently it has become a prominent activity for children to engage in, therefore displacing the more traditional childhood activities that centred around physical exertion.

The promotion of PE has manifested itself over the last decade, however the actual amount of time spent in PE has not been established with the actual amount of quality time in PE even less so. The second over-arching theme is Time spent in physical education, displayed in figure 6.

If only they had longer

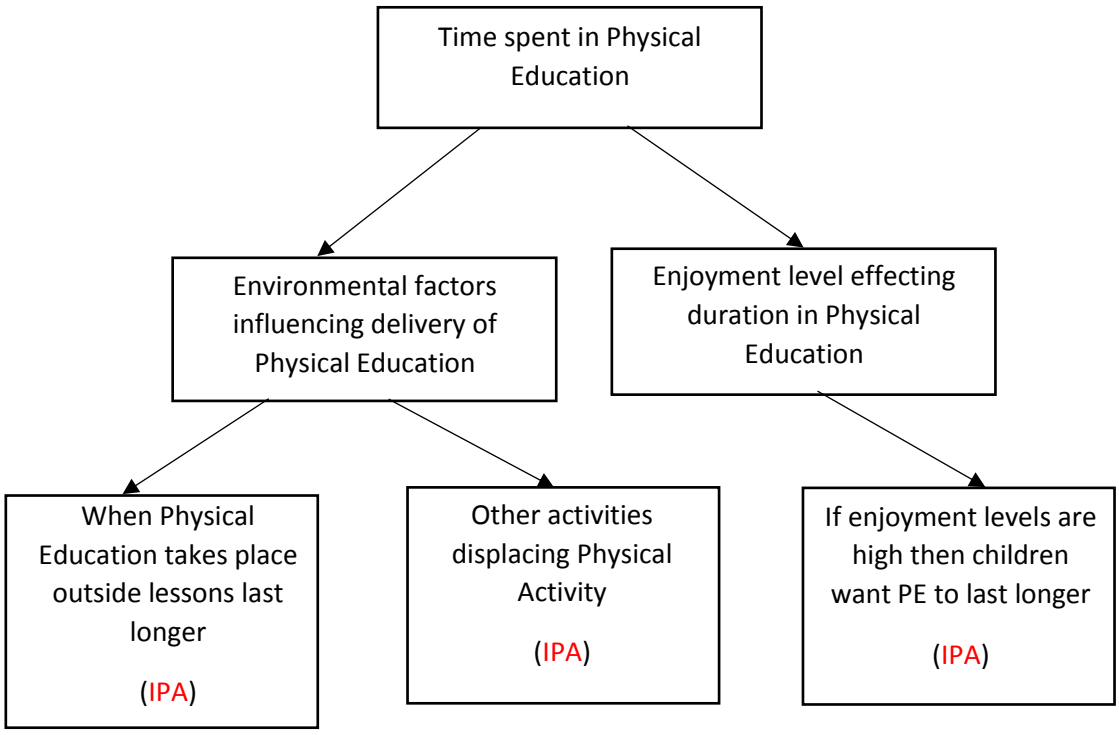

Figure 6 Thematic map for Time spent in Physical Education in child focus group interview

Throughout the interview children emphasised how much they enjoyed PE and commented on wanting PE to *last longer* (Abbie, aged 9). However, in their experiences, children commented on how environmental factors influence upon the amount of time children get to spend in PE.

> *... we only get half an hour, like. But I like it better outside because you can have more fresh air and you do it for longer* (Joe, aged 10) *... Yeah when we get to go outside on the playground or field PE always lasts longer* (Claire, aged 9) *...Yeah because when we had PE last, before it was lunchtime, they need to come and set up the tables so we don't get to do it for long* (Theo, aged 9) ... *outside you don't have to wait until the dinner ladies come* (Callum, aged 10).

Space in schools is limited and therefore the same space is quite often used for both a PE lesson and a dining hall. Children have experienced the procedure needed to accommodate this, however it has implications on the amount of time they get in PE; their lesson is inevitably cut short and therefore without even commencing the lesson,

sixty minutes of moderate to vigorous activity is not going to happen due to choices being made by the school. Sixty minutes of moderate to vigorous activity a day is expected from the government, however, most schools only provide two PE slots a week, sometimes these slots not even equating to sixty minutes. Even though the government have highlighted the importance of physical activity, PE is the first lesson to get dropped when 'something more important' comes along. Interestingly, there were reasons beyond a pressured curriculum for the absence of PE:

> *We don't do it anymore with Mr Baxter* (Abbie, aged 9) ... *No, Mr Baxter doesn't do PE with us, he stopped it* (Claire, aged 9) ... *Yeah, I don't think he likes it* (Callum, aged 10) ... *We sometimes have to do other stuff like finish our class work* (Ruby, aged 10)

This inference by the children explains that PE is still not getting the recognition it needs to be getting to have a positive effect on young people. Academic pressures mount in school teachers and importance is tailored elsewhere. This also highlights the response non-PE specialist teachers may give PE. All primary school teachers are expected to lead a minimum of one hour of PE a week if not more. Teachers that do not feel comfortable or confident in PE cannot portray to children the importance and benefits of PE and as well as expect children to be fully engage. Therefore, leading to children not responding to the lesson and failing to give one hundred percent. Consequently, some children never reaching their maximum potential in PE.

Being OK with fatigue

The final over-arching theme for the focus group interview with the children was the physical exertion levels children experienced in PE. Physical exertion in PE is one of the main contributions to obtaining a healthy lifestyle and successfully achieving moderate to vigorous activity within the school day. Figure 7 summarises the perceptions and experiences children reported when talking about PE regarding their physical exertion.

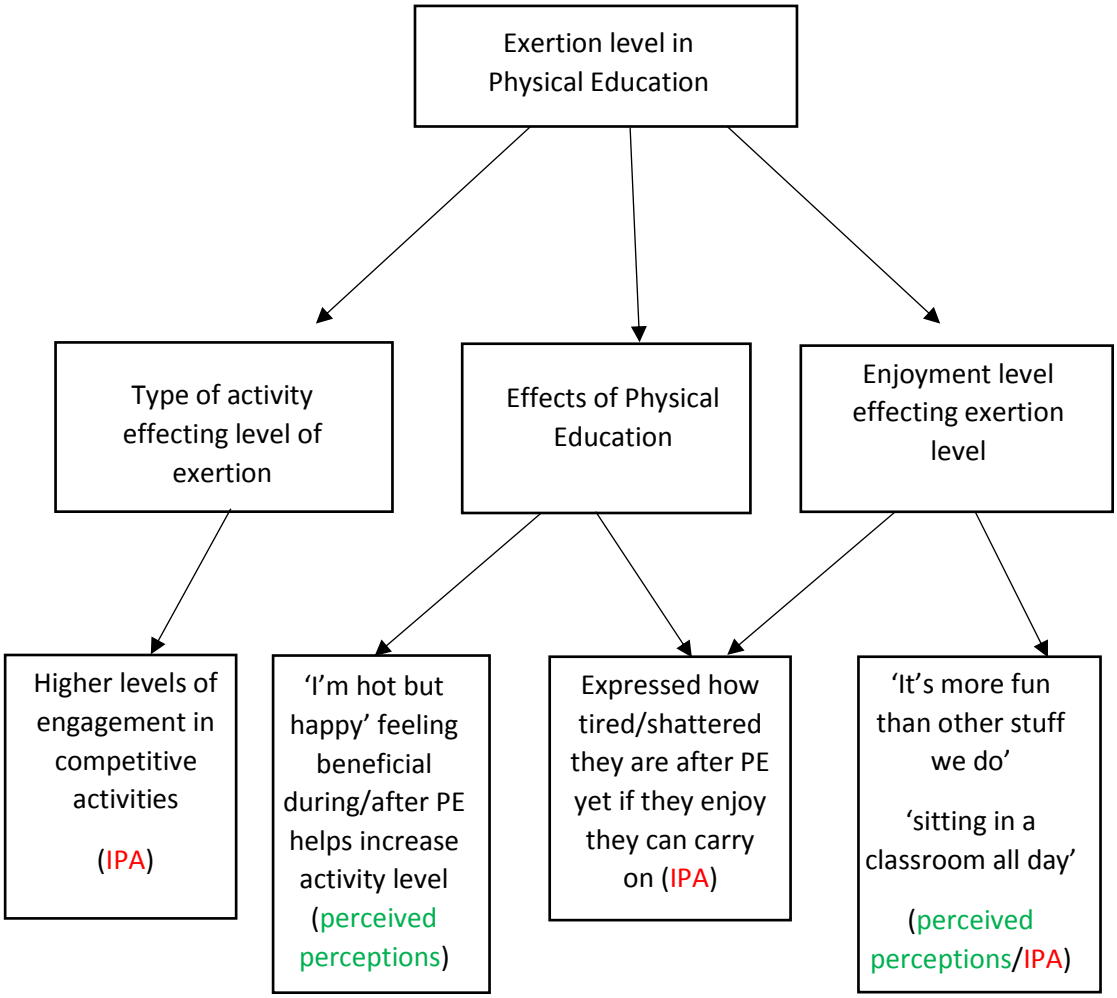

Figure 7 Thematic map for Exertion level in Physical Education in child focus group interview

To benefit from PE, children need to successfully engage with the activities delivered and produce a significant level of exertion (Hills, Dengel and Lubans, 2015). Children throughout the interview commented upon how hard they work in PE with some commenting that they work *really* hard and others saying *quite* hard. At no point during the interview did any child express that they did not work hard in PE. This falls in line with Neely and Holt's (2014) study where children perceive themselves to be working harder than they truly are. When questioned how children felt after PE they commented:

Shattered (Callum, aged 10) ... *I'm hot but I'm happy* (Abbie, aged 9)

... *Well for me, after PE has finished I am just... yanno, tired* (Theo, aged 9)

... *Yeah, if we have break time after PE I would usually be playing football but I know I'm tired because sometimes I don't play* (Joe, aged 9)

... *I like it, the fact that I know I've worked hard, If I don't feel like that there was no point* (Callum, aged 10).

This highlights that children perceive themselves to have worked hard in PE, even explaining that they are too tired to continue any physical activity on the playground. However, children began to comment that after PE they would want to carry on with more, alongside wishing that lessons lasted longer. This explanation had to be questioned; if they have worked so hard that they are *shattered* and *tired*, how and why would they want to carry on?

Because it's more fun than other stuff we do (Joe, aged 9) ... *Yeah like sitting in a classroom all day* (Theo, aged 9) ... *It's when we are having fun* (Joe, aged 10) ... *Yeah, very much fun* (Claire, aged 9) ... *PE is the fun part of the day* (Ruby, aged 10)

Children here are portraying that their experiences in PE are much better than other subjects; 'sitting in a classroom all day'. This implies that other subjects are boring as PE is the only subject that inevitably allows children to *let off steam* and *freely engaging in activity*. This being the case, engagement in PE should be prosperous and there should be no need for government policies and recommendations to get children more active.

When children were questioned about when they experienced being the most active in PE they stated:

I try my hardest in like a match... (Theo, aged 9)

... It's always fun when we complete against each other and have competitions... we work hard most of the time (Callum, aged 10)

Yeah, I work harder when I go against my friends, were still friends but I want to have fun with my friends (Abbie, 9)

This emphasises that competition is a driving force for high levels of exertion and engagement in PE. Redelius et al (2015) supports this notion by explaining that different types of PE lessons harvest different exertion levels in children. As stated from the interviews competition is obviously a stimulus for children to engage in physical activity. However, the interviews also highlight that class type also effects activity level:

> *... like when we do gymnastics ... we're just sitting down, you're just waiting...* (Theo, aged 9)
>
> *You're Bored* (Joe, aged 9)

If children are having a negative experience of PE then they are more likely to disengage. However, the National Curriculum states that children need to be taking part in activities such as: control and balance which are prominent in sports such as gymnastics. If teachers (and sports specialist) have to follow such criteria then those activities need to be taking place.

If you're good at PE you'll love PE

The second interview focused on the experiences from the eyes of the PE teacher. With being a PE specialist, in general the specific views were orientated towards PE:

> *Well I think PE is massive but I have slightly blinkered eyes on it with it having such a big impact upon my life and still doing so today.*

Mr Martin infers that the foundations for PE are there you just need to engage and take part and you will enjoy physical activity, which leads us on to our first over-arching theme.

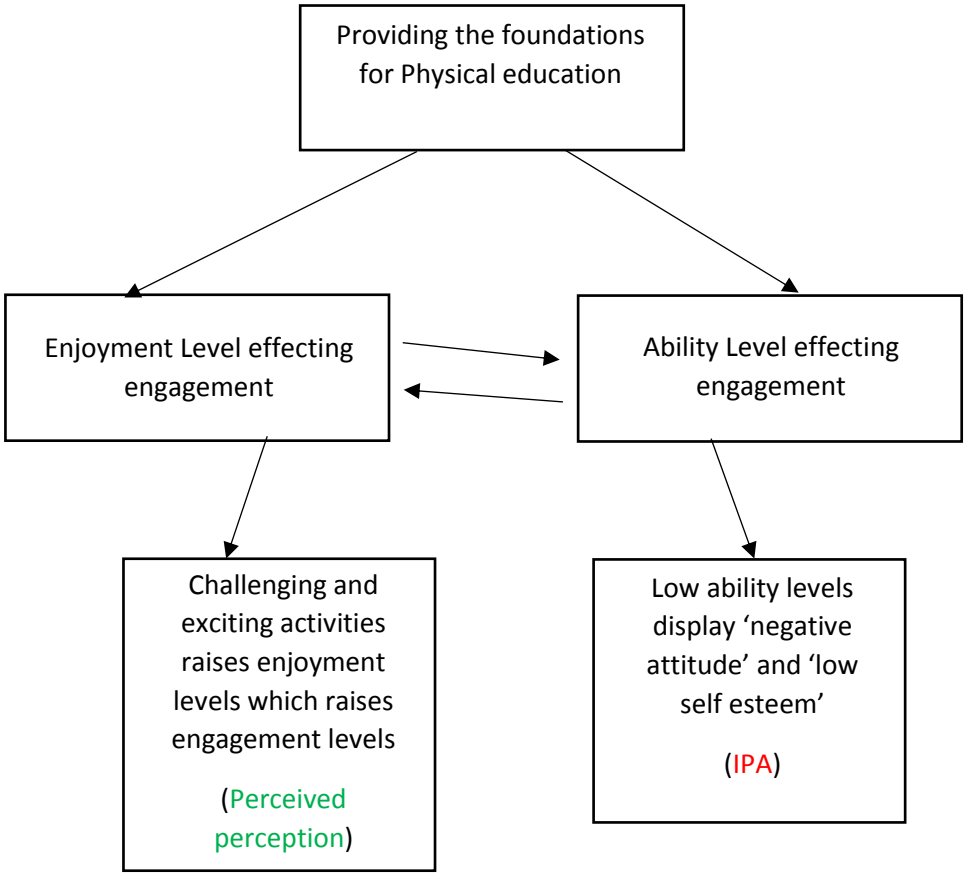

Figure 8 Thematic map Providing the foundations for Physical Education in PE Teacher interview

Children's enjoyment level in PE has been researched and significant findings have found positive correlation between enjoyment levels and engagement levels. Mr Martin explains his thoughts on this through his experiences:

> *If you are good at PE, you will love PE. From experience children who have experienced PE automatically love PE, if they're reasonably good from the start then you stay good throughout... if they have been brought up around sport and had positive experiences then there're more likely to engage than the children that have had negative experiences.*

Mr Martin expresses that the enjoyment level for PE comes from being good at PE. If those basic motor skills have been learnt at a young age then the foundations of PE

have been engrained and you are more likely to engage, because of enjoyment, in PE. Therefore, the type of activity again effects engagement because of enjoyment.

> *... I like that they learn the foundations before anything else. To learn how to walk before you can run, then learn how to run properly... they learn co-ordination, how to hold things and how to make contact with things. Catching, balancing hoping, jumping, skipping. All things that need to be learnt before being thrown into a netball or football match. If you can't do the basics you won't enjoy the sport.*

This highlights reasons why children may be disengaging with PE today, if from the outset children are not being taught the right thing then PE will become a negative experience as children will develop *''low self-esteem''.*

If something has got to give, it's often PE!

The second over-arching theme is environmental factors effecting PE. Without finding a school that has a designated PE specialist with a designated hall and facilities, environmental factors will, at the school's discretion, be a deterrent from PE. Figure 9 highlights how Mr Martin's experiences and perceptions of PE are influenced by environmental factors.

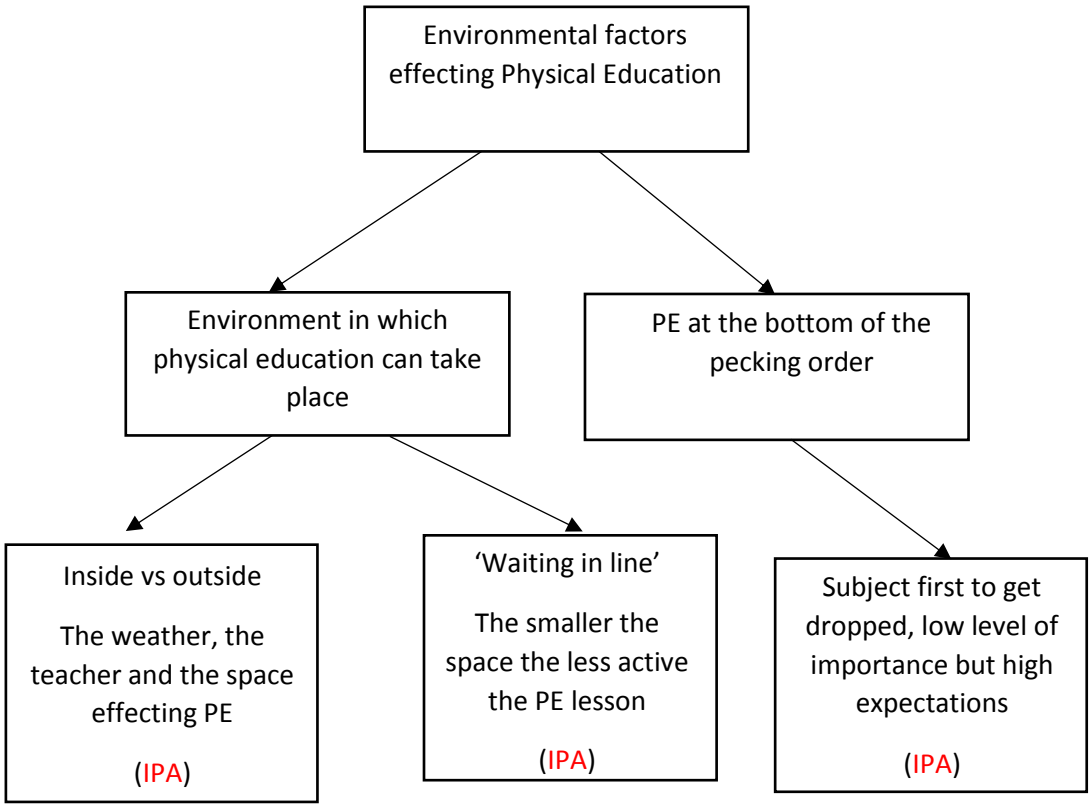

Figure 9 Thematic map Environmental factors effecting Physical Education in PE Teacher interview

When regarding PE, it can get frustrating when uncontrollable circumstances prevent fulfilling the demands of the curriculum. In particular, for PE specialist, coaches and teachers who have a passion for PE and want to provide the children with PE that will benefit them completely. Mr Martin highlights some of the barriers he has faced:

> *Straight away there are limitations to intensity when you are stuck on a unit in a hall, you can only provide a certain intensity, if you have to have a queue of six they will only be working 10 seconds of every minute, maximum. That is the ones who are on task. But when I do athletics I flog um, were outside so we can do sprint session and reach those high levels of intensity ... it's an hour long and there're blowing the whole time.*

As we already know inside space has many limitations, here Mr Martin reinforces that not only is the lesson time cut short but also the limited amount of space reduces the amount of time children can spend in levels of exertion, and that is if children can even get to high levels of exertion inside. However, Mr Martin uses the term '*flog um'* and

the children are *'blowing'*. This terminology speculates that the children would be at an unsatisfying level of high intensity. As previously stated during the focus interview with the children, Claire explained '*time flies when you're having fun*'. Here, Claire explained that PE lessons are enjoyable. Joe also highlights '*I don't think every lesson goes fast if it isn't fun, it depends what we're doing ... like when we're inside I can't run as fast as I can, but when I'm outside it's so much more fun so I can try harder'.* Joe explains that he enjoys being outside where he can *try harder* and *run much faster*. However, consideration has to be taken into account for the levels of exertion being put on the children to remain at an enjoyable level, alongside, all children feeling comfortable doing this. The children selected for interview appear a physically active group, but not all children will feel the same. A limited number of children will enjoy being '*flogged'* or *'blowing'* therefore, PE will become an embarrassment and taking part will be less favourable.

With unbeknownst documents and policies in place today regarding healthy eating and improving children fitness to facilitate wellbeing, PE should be imperative to schools. However, at the majority of school's discretion PE is always the first subject to get dropped, replaced or forgotten about. Mr Martin explains:

> *If something has got to give its often PE. If it's not dinner time, its playtime ... that lesson I've just done, it can go on until 10.30 but I don't have the space until 10.30. Like today, I can't do PE from 2 o'clock because it's the queens tea party, the hall spaces are being used ... until they put PE in the same category as maths and literacy then it just won't be the case.*

If schools are to achieve the outcome set out by the government more emphasis needs to be placed on PE, however, Mr Martin explains; *schools aren't judged in that.* Until PE becomes a formative assessment then it will just keep getting neglected and displaced with whole school and social activities. Chen, Kim and Gao (2014) explain that PE is the most popular subject to get dismissed for more important activities. Supporting this, during the research process, three PE lessons were cancelled due to events the school had organised, which were not physical activity based.

PE isn't the only way to be active

In connection to this Mr Baxter, the classroom teacher, supports the notion that PE is only an opportunity that helps children to focus upon other core subjects. When the class teacher was asked the main benefit to PE; he explained:

> Our class *really benefit from all the team stuff because they just couldn't work together. So, the team work approach that they have learnt through PE and the practical side of things has really helped them. We've now been able to do science investigations and stuff, so I would say teamwork is the most important thing they learn from it.*

This suggests that the children's wellbeing and lifestyle are not taken into consideration when regarding PE, but solely an academic focus. Implying that children will be more attentive and achieve better in written based subjects as PE addresses that need. Further, Mr Baxter adds:

> *There are plenty of opportunities to be active and not just in PE. We come outside and do active things in our lessons whenever we can. We do map reading in geography, orienteering courses where we're running around ... and there's playtimes every day.*

A non-specialist in PE will highlight that there is enough designated time to being physical active within the school day. This may be correct. However, if that time is not influential to children then there is very little point in considering it.

Chapter 8 Bringing it all together: Profiling and Experiences

Introduction

The purpose of this chapter is to 'bring together' and make sense of the issues raised in the thesis; to underpin the research aim and systematically draw together the objectives undertaken to achieve this. The thesis aimed to underpin activity levels of primary school children in terms of context, intensity and experiences. Four objectives were set to achieve this using both qualitative and quantitative approaches. This chapter will start by, raising concerns from a methodological perspective and highlighting the use of a mixed method approach. Further, the systematic observation assessment will be intertwined with the interviews from the children and the teachers posing in depth discussion to advise future research from what has been discovered. Finally, the chapter will reflect on the entire research process, making proposals for future research and recognising limitations whereby suggestions can be made to enable improved future development of PE.

The findings from a methodological perspective

An objective, systematic approach was used in order to capture accurate and precise data, alongside adopting a phenomenological position. Authors claimed '...phenomenology as an approach to research has gained increased currency' (Hayllar and Griffin, 2005). Whilst according to Merleau-Ponty phenomenology '...tries to give a direct description of our experiences as it is...' (1986: 7). Which in turn, leads us to this stance in the research. King and Horrocks (2010) highlight that the contextual position of the researcher allows understanding of the produced knowledge. Therefore, advocating bias, but in actual fact the researcher becomes the 'co-producer' of knowledge and is able to keep the research on task to validate the aims of the study (King and Horrocks, 2010:21). The challenge in this research was to accumulate objective data from sixteen children's activity profiles, then isolate that

data whilst understanding their experiences of PE in relation to context, duration and intensity, to then finally combine both sets of data together to allow methodological triangulation which will permit one method to inform the other.

We all know about the health benefits

In terms of understanding the health benefits and implications to a better lifestyle by taking part in physical activity, it is clear to state that all sections of the population know PE has the potential to contribute (Clark, 2015). If conclusions could be drawn, that primary school children did not understand why PE is necessary, then low levels of engagement could be better comprehended. However, this study highlights that children aged 9 and 10 have a clear grasp of the underlying intentions of PE. With all the participants reporting or in agreement that the health benefits of PE are a clear indicator as to why we have it. Abbie explains that PE *gives us a bright future and keeps us healthy.* If this is the case, then it still remains furtive to investigate why children understand the benefits of PE but are still disengaging.

In general, the activity profiles illustrated that children did not engage in enough moderate to vigorous physical activity in either gymnastics or multi skills, with 0% of the children even reaching very high intensity activities. This is supported with Mr Martin, the PE teacher, explaining environmental factors influencing intensity:

> *when you are stuck on a unit in a hall, you can only provide a certain intensity, if you have to have a queue of six they will only be working 10 seconds of every minute, maximum.*

Furthermore, static and low activity dominated throughout both sets of data (boys totalling 64% and girls 74%) and boys displayed higher levels of activity than girls overall ($F(1,14) = 14.379$, $p = .002$, $\eta_p^2 = .507$), especially in multi-skills and only a slight incremental difference in gymnastics. Girls displayed the most sedentary activities throughout the lessons ($F(1,14) = 9.426$, $p = .008$, $\eta_p^2 = .402$), even when tasked to be engaged in activity. This contradicts what the girls highlighted in the interviews: specifying that they *worked hard throughout the lesson*. However, it was

predominately the boys who reported feeling *shattered* and unable to continue activity after PE.

As with all self-report tools, a number of well-recognised biases can be found (Choi and Pak, 2005). In this case, as the interviews displayed, all the participants reported themselves as being very active, throughout PE and outside of school. The random sample selected may have been a selection of the most physically active children in the class. Therefore, to generalise these finding would be unrealistic. Furthermore, the participants may have portrayed themselves in a favourable light towards taking part in physical activity throughout PE. This would not only portray themselves as leading a healthy lifestyle but they would also believe that they were conforming to what they should be doing in PE: not actually what they are doing in PE. On the other hand, we have to take into account perceived perceptions (Carroll and Loumidis, 2001), children may actually think they are contributing to PE the desired amount, however this research and many others suggests they are not. If children think that they are contributing the satisfied amount to PE then that may be the first obstacle to overcome.

Class type in relation to exertion levels

Class context was a central part of the research with focus upon gymnastic and multi-skills. The same amount of lesson time was observed in both activities with both lessons taking place inside. Telama et al. (2005) explains that different activities in PE have different physical effects. As we already know the National Curriculum expects PE to encompass many different aspects including: strength, stamina and core stability as well as providing knowledge into healthy eating and nutrition. At all points during the delivery of these lessons children are not going to be performing high levels of activity, if at times any at all. With regards to this study, a significant difference was found concerning class type ($F(1,14) = 389.804$, $p < .0005$, $\eta_p^2 = .965$). Higher levels of activity were displayed by both boys and girls in multi-skills rather than gymnastics, with 10% of the time performing at high activity in multi-skills and only 3% in gymnastics. As well as, a gender class type also being significant: with boys displaying

higher levels of activity in multi-skills and girls displaying higher levels of activity in gymnastics ($F(1,14) = 14.708$, $p = .002$, $\eta_p^2 = .512$). With the nature of the lesson types examined multi-skills is designed as a more physically exerting activity, with emphasis upon strength and stamina as well as developing basic fundamental skills. For boys to experience more activity in this than gymnastics supports the notion that boys are more physically active than girls: as gymnastics is orientated around flexibility, balance and core strength. As well as exertion levels, engagement levels also support this. Girls displayed higher levels of disengagement (off task) in multi-skills (56.3%) and boys displayed higher levels of disengagement in gymnastics (43%). The main issue to highlight here is: when girls were disengaged in multi-skills they were displaying sedentary (static) behaviours, whereas when boys were disengaged in gymnastics they were displaying higher levels of activity than what they had been tasked to do.

Reporting their experiences of gymnastics, also accentuated the research results. The three boys explained that gymnastics was *boring* and *they were always waiting in line*. This was supported by the PE teacher explaining that gymnastics is a hard sport to teach when pressures are demanding such high levels of activity. 45% of children's time in gymnastics was observed to be static behaviour, however 32% of that time was due to on task learning time. Children spent more than 10% of the time listening to the teacher in gymnastics than in multi-skills, this could be an influential factor for boy's disengagement in this activity. In connection to this, enjoyment levels must be a contributing factor. On interview the female participants commented that they enjoyed gymnastics, whilst all expressed going to gymnastic clubs outside of school too. Whereas the male participants explained that they much preferred competitive activities, specifically football matches and activities they can compete against their friends in.

Exertion levels in relation to intensity and duration

0% of children's time observed in PE was recorded at very high levels of activity. An explanation for this can be environmental factors. As both activities observed were located inside, children never got the opportunity to reach and present the highest

level of exertion (rated number 10 on ELAP). The focus group interview highlighted children negatively expressing their experiences of PE located inside. Children explained that *when they were inside they could not run as fast as they could* ... but when they were outside *it was so much more fun, where they could try so much harder*. To draw conclusion to this context, it supports the data received from the activity profiling. No one was recorded at an exertion level of 10 due to the PE lesson being inside. Supporting this the PE teacher explained that *teaching a unit of PE inside is challenging*, *within one minute a child would only display 10 seconds of high level intensity and that is only if the child is on task*. As we have already distinguished, for boys regarding this study, they were not even on task during gymnastic: where waiting in line is most prominent. This factor needs to be considered when schools are planning PE, however seasonal factors in the UK will also be a deterrent from always taking part in PE outside.

Another contributing factor to participating with PE inside is the location of indoor PE. The majority of primary schools use the hall for indoor PE, this also acts as the children's dining hall. Therefore, with specific lessons, PE will be cut short. As displayed in this study, an average of thirty-three minutes was observed of lesson time taking part in physical activity. Therefore, emphasising that an average of two PE lessons a week will amount to 120 minutes of physical activity is inaccurate. This research supports the study that Inactive UK (2016) conducted when primary schools did not know how much time children were actually spending in PE. This only highlights the foolishness to assume that by designating two hours to PE a week, children are actually achieving that. Regardless of what children are actually doing once participating.

What are children doing in PE?

More often than not literature fails to tell us the reasons why chidden are not active in PE. Many researchers highlight that children are under achieving and this is a global issue, but without knowledge of what is making children under achieve there is little we can do about it. The assessment tool used to profile children in PE did not only

generate an exertion level but also provided information about what the children were doing at that particular time.

Time spent in learning was reported the highest for children in gymnastics, supporting the notion that children displayed more sedentary behaviours in gymnastics than multi-skills. This contextual information gives the statistical data greater dearth and explanation. Children may have been generalised as being more sedentary in gymnastics than multi-skills, however more learning took place in gymnastics therefore the data becomes plausible. The main concern arises for researchers when the children are displaying those sedentary behaviours when they are supposed to be displaying active behaviours. This can be seen with girls in multi-skills: when they are coded off task they are displaying sedentary behaviours (rated at level 0 in ELAP) which means low levels of active behaviour are displacing high levels of activity.

The need for specialism in PE

Within a primary school setting any teacher can teach PE, Metzler (2017) explains that this has adverse effects on the quality of lessons delivered. However, as school funding is constantly getting cut, schools have to prioritise where and what needs that money the most. Until PE gets categorised alongside Maths and English it will never receive the same recognition. Therefore, employing PE specialist is not a priority to schools today, even with worldwide epidemic of an inactive lifestyle.

As the school in this study employed a PE specialist it was interesting to investigate into the views of a PE specialist (Mr Martin) and a non-PE specialist (Mr Baxter) when regarding PE. Children explained that PE with Mr Martin was *always funs and they looked forward to this part of the day*. They later explained that *PE with Mr Baxter rarely happened*. To add context to this, Mr Baxter explained that Physical activity can be gained from other subjects, not just PE. Maths Geography and English can have active elements if the teacher will allow it. However, that is the problem. This idea cannot be relied on alone. As government guidelines don't state this needs to happen teachers will only incorporate such activities at their discretion, which for some may

be never. This idea can be looked at in the future to further raise the profile of PE but to solely rely on this would be inappropriate.

Implications and future research

Engagement and productivity of PE still remains an issue. Nationally, the number of children taking part in moderate to vigorous intense activities is continually reducing (Sport England, 2016), with standards in PE remaining optimistic. To productively assess children's engagement in physical activity not only exertion level needs to be considered but also activity context.

This research gave a wealth of knowledge into children's activity levels in PE lessons, however only gymnastics and multi-skills were observed. Although significant class type differences were highlighted, future research may explore into other class types and distinguish any gender differences that arise. It may be worth establishing in the future weather PE encompasses too many aspects to tackle in one over-arching title, therefore to divide PE into two separate areas: Physical activity and Healthy living. This may alleviate some of the problems PE is getting tarnished for.

Secondly, this research highlights many areas in which boys and girls are falling short in PE, forthcoming research can now identify and implicate interventions for resolving such problems to pin point how PE can be implemented as a beneficial lesson.

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